Section I: Basic Course Information

Outline Status:

1. College: Southwest

2. Subject (Discipline) Name: Chemistry

3. Course Number: 212

4. Course Title: Organic Chemistry for Science Majors II

5. Units: 5

6. Catalog Course Description -- Provide a description of the course, including an overview of the topics covered:

   This course is a continuation of the study of organic compounds that started with Chemistry 211. Emphasis is placed on the synthesis of organic compounds and mechanisms of organic reactions. Topics on organic molecules of biological importance such as amino acids, peptides and carbohydrates are also covered. The laboratory work focuses on the synthesis, isolation, purification, and instrumental analysis of organic compounds.

7. Class Schedule Course Description -- Provide a brief description of the course, including an overview of the topics covered:

   This course is a continuation of the study of organic compounds that started with Chemistry 211. Emphasis is placed on the synthesis of organic compounds and mechanisms of organic reactions.

8. Initial College Approval Date: 11/16/04

9. Updates (check all applicable boxes):

   - Content
   - Objectives
   - College Specific Course Attributes/Data Elements
   - Districtwide Course Attributes/Data Elements
   - Other (describe)

   Last Update:

   Underlined course attributes are the same for the course throughout the LACCD; all other course attributes are college specific.
10. CLASS HOURS:

<table>
<thead>
<tr>
<th></th>
<th>&quot;Standard Hours&quot; per Week (based on 18 weeks)</th>
<th>Total Hours per Term (hrs per week x 18)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>3</td>
<td>54</td>
<td>3</td>
</tr>
<tr>
<td>Lab/activity (w/ homework)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lab/activity (w/o homework)</td>
<td>6</td>
<td>108</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>9.00</td>
<td>162</td>
<td>5.00</td>
</tr>
</tbody>
</table>

Note: The Carnegie Rule and Title 5, section 55002 sets forth the following minimum standards: 1 unit = 1 hour lecture per week, 2 hours homework per week; OR 2 hours per week of lab with homework; OR 3 hours of lab per week without homework. The hours per week are based on a standard 18-week calendar. Lecture also includes discussion and/or demonstration hours, laboratory includes activity and/or studio hours.

11. PREREQUISITES, COREQUISITES, ADVISORIES ON RECOMMENDED PREPARATION, and LIMITATION ON ENROLLMENT

Note: The LACCD’s Policy on Prerequisites, Corequisites and Advisories requires that the curriculum committee take a separate action verifying that a course’s prerequisite, corequisite or advisory is an “appropriate and rational measure of a student’s readiness to enter the course or program” and that the prerequisite, corequisite or advisory meets the level of scrutiny delineated in the policy.

ENTRY SKILLS FOR COURSES WITH PREREQUISITES:
1. Write Lewis and resonance structures of organic compounds.
2. Apply principles of valence bond theory and molecular orbital theory—hybridization, resonance, electronegativity and polarity and formal charge—to problems of molecular structure.
3. Explain the reaction kinetics and mechanisms of simple organic reactions such as nucleophilic substitution and elimination reactions.
4. Determine the structures of organic molecules using IR and NMR spectroscopy.
5. Predict the IR and NMR spectra of molecules given their structures.
6. Apply retrosynthetic techniques in the synthesis of organic molecules.
7. Use stereochemistry to explain structure and reactivity in organic molecules.
8. Name alkanes, haloalkanes, alkenes and alcohols by the IUPAC system.
9. Collect and analyze scientific data, including the use of graphical methods.

Prerequisites: Yes  (If Yes, complete information below)

Corequisite: None  (If Yes, complete information below)
12. **REPETITIONS** -- Number of times course may be repeated for credit (three maximum): 0 (see: Section V, #9)

13. **OTHER LIMITATIONS ON ENROLLMENT** (see Title 5, Section 58106 and Board Rule 6803 for policy on allowable limitations. Other appropriate statutory or regulatory requirements may also apply):

<table>
<thead>
<tr>
<th>Subject</th>
<th>Number</th>
<th>Course Title</th>
<th>Units</th>
<th>Validation Approval Date (official use only)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   None
### Section II: COURSE CONTENT AND OBJECTIVES

1. COURSE CONTENT AND OBJECTIVES:

<table>
<thead>
<tr>
<th>COURSE CONTENT AND SCOPE – Lecture:</th>
<th>Hours per topic</th>
<th>COURSE OBJECTIVES - Lecture (If applicable):</th>
</tr>
</thead>
<tbody>
<tr>
<td>If applicable, outline the topics included in the lecture portion of the course (outline reflects course description, all topics covered in class).</td>
<td>3</td>
<td>1. Use molecular orbital theory to explain UV and visible spectra.</td>
</tr>
<tr>
<td>1. Ethers, Epoxides, and Sulfides: physical properties, nomenclature and spectroscopy; synthesis of ethers using the Williamson ether method; synthesis of epoxides; acid- or base-catalyzed ring opening of epoxides; reactions of epoxides with Grignard reagents and organolithium reagents.</td>
<td>3</td>
<td>2. Explain fundamental reactivity and properties of aromatic compounds.</td>
</tr>
<tr>
<td>2. Sulfides (continued), and Conjugated Systems: conjugation study using UV and visible spectra</td>
<td>2</td>
<td>3. Apply retrosynthetic techniques in formulating the synthesis of organic compounds.</td>
</tr>
<tr>
<td>3. Orbital Symmetry and Ultraviolet Spectroscopy</td>
<td>2</td>
<td>4. Correlate the molecular structures of ketones, aldehydes, carboxylic acids, amines, and phenols with their physical properties and chemical activity.</td>
</tr>
<tr>
<td>4. Ultraviolet Spectroscopy (continued), Aromatic compounds: nomenclature of selected aromatic hydrocarbons; structures and properties of substituted benzenes; use of the molecular orbital theory to predict the stabilities of benzene and cyclobutadiene; rules for aromaticity</td>
<td>3</td>
<td>5. Describe the mechanisms for organic condensation, complex addition, and amine reactions.</td>
</tr>
<tr>
<td>5. Aromatic Compounds (continued): nomenclature and the chemistry of aromatic ions, heterocyclic aromatic compounds</td>
<td>3</td>
<td>6. Predict the products of reactions involving organic compounds (ethers, sulfides, aromatic compounds, ketones, aldehydes, carboxylic acids, amino acids, peptides, and carbohydrates.</td>
</tr>
<tr>
<td>6. Reactions of Aromatic Compounds: products of halogenation and nitration of benzenes; effects of activating and deactivating groups on the benzene rings; products of substitution on substituted benzenes</td>
<td>3</td>
<td>SLOs:</td>
</tr>
<tr>
<td>7. Reactions of Aromatic Compounds (continued): name reactions such as Friedel Crafts, Gatterman-koch reactions or the Birch reduction reaction</td>
<td>2</td>
<td>As a result of this learning experience, a student can:</td>
</tr>
<tr>
<td>8. Ketones and Aldehydes: nomenclature; synthesis of aldehydes and ketones; physical properties of ketones and aldehydes and their reactions; spectroscopy of aldehydes and ketones</td>
<td>3</td>
<td>1. Name an organic compound given its molecular structure (or vice versa).</td>
</tr>
<tr>
<td>9. Amines: nomenclature of amines; structures and physical properties of amines</td>
<td>3</td>
<td>2. Synthesize selected organic compounds using proper techniques and determine their yield.</td>
</tr>
<tr>
<td>10. Amines (continued): synthesis of amines; reactions of amines</td>
<td>2.5</td>
<td>3. Purify selected organic compounds using proper isolation techniques.</td>
</tr>
<tr>
<td>11: Carboxylic Acids: nomenclature of carboxylic acids; synthesis of carboxylic acids</td>
<td>3</td>
<td>Assessment Tools for SLO’s:</td>
</tr>
<tr>
<td>12. Carboxylic Acids (continued), Carboxylic Acid Derivatives: nomenclature and synthesis of carboxylic acid derivatives</td>
<td>3</td>
<td>1. Embedded questions on exams.</td>
</tr>
<tr>
<td>13. Carboxylic Acid Derivatives (Continued), Alpha Substitutions: reactions of carboxylic acids</td>
<td>3</td>
<td>2. Grading rubric of percent yield in student lab reports.</td>
</tr>
</tbody>
</table>

SLOs:

As a result of this learning experience, a student can:

1. Name an organic compound given its molecular structure (or vice versa).
2. Synthesize selected organic compounds using proper techniques and determine their yield.
3. Purify selected organic compounds using proper isolation techniques.

Assessment Tools for SLO’s:

1. Embedded questions on exams.
2. Grading rubric of percent yield in student lab reports.
3. Grading rubric of melting point in student lab reports.
| 14. | Condensations of Enols and Enolate Ions | 3 |
| 15. | Carbohydrates and Nucleic Acids: carbohydrate classification; nomenclature of carbohydrates; synthesis and reactions of carbohydrates | 3 |
| 16. | Amino Acids, Peptides, and Proteins: nomenclature of amino acids and peptides; synthesis and reactions of amino acids and peptides | 3 |
| 17. | Lipids: nomenclature of lipids; synthesis and reactions of lipids | 4.5 |
| 18. | Exams | 2 |
| 19. | Final Exam | 3 |

| Total Lecture hours* | 54 |

**COURSE CONTENT AND SCOPE -- Laboratory:**

If applicable, outline the topics included in the laboratory portion of the course (outline reflects course description, all topics covered in class).

<table>
<thead>
<tr>
<th>Hours per Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>24</td>
</tr>
<tr>
<td>19</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

| Total Lab hours* | 108 |

**COURSE OBJECTIVES - Laboratory (If applicable):**

Upon successful completion of this course, the student will be able to… (Use action verbs – see Bloom’s Taxonomy below for “action verbs requiring cognitive outcomes.”)

1. **Employ safe practices in the organic chemistry laboratory, including the identification and handling of hazardous chemicals and the disposal of organic wastes.**
2. **Use distillation, extraction, recrystallization, and vacuum filtration techniques to purify organic compounds.**
3. **Determine the melting point range for a solid compound and the refractive index of organic compounds to analyze their purity.**
4. **Perform and explain the syntheses of organic compounds using classic reactions, such as Fischer esterification, Diels-Alder, Grignard and Aldol reactions.**
5. **Use infrared (IR) and NMR spectra to determine the structure of organic compounds.**
6. **Record data and observations in a laboratory notebook according to research standards. Analyze data using numerical or graphical techniques.**
7. **Utilize reference books such as Handbook of Physics and Chemistry or Aldrich catalog or online databases to write laboratory reports.**

*Total lecture and laboratory hours (which include the final examination) must equal totals on page 1.

---

2 In general “activity” courses or portions of courses are classified “laboratory.”
### Bloom’s Taxonomy

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Comprehension</th>
<th>Application</th>
<th>Analysis</th>
<th>Synthesis</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>define</td>
<td>translate</td>
<td>interpret</td>
<td>distinguish</td>
<td>compose</td>
<td>judge</td>
</tr>
<tr>
<td>repeat</td>
<td>restate</td>
<td>apply</td>
<td>analyze</td>
<td>plan</td>
<td>appraise</td>
</tr>
<tr>
<td>record</td>
<td>discuss</td>
<td>employ</td>
<td>differentiate</td>
<td>propose</td>
<td>evaluate</td>
</tr>
<tr>
<td>list</td>
<td>describe</td>
<td>use</td>
<td>appraise</td>
<td>design</td>
<td>rate</td>
</tr>
<tr>
<td>recall</td>
<td>recognize</td>
<td>demonstrate</td>
<td>calculate</td>
<td>formulate</td>
<td>compare</td>
</tr>
<tr>
<td>name</td>
<td>explain</td>
<td>dramatize</td>
<td>experiment</td>
<td>arrange</td>
<td>value</td>
</tr>
<tr>
<td>relate</td>
<td>express</td>
<td>practice</td>
<td>test</td>
<td>assemble</td>
<td>revise</td>
</tr>
<tr>
<td>underline</td>
<td>identify</td>
<td>illustrate</td>
<td>compare</td>
<td>collect</td>
<td>score</td>
</tr>
<tr>
<td></td>
<td>locate</td>
<td>operate</td>
<td>contrast</td>
<td>construct</td>
<td>select</td>
</tr>
<tr>
<td></td>
<td>report</td>
<td>schedule</td>
<td>criticize</td>
<td>create</td>
<td>choose</td>
</tr>
<tr>
<td></td>
<td>review</td>
<td>shop</td>
<td>diagram</td>
<td>set up</td>
<td>assess</td>
</tr>
<tr>
<td></td>
<td>tell</td>
<td>sketch</td>
<td>inspect</td>
<td>organize</td>
<td>estimate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>debate</td>
<td>prepare</td>
<td>measure</td>
</tr>
</tbody>
</table>

**SIMPLE SKILLS <--------------------------->> COMPLEX SKILLS**

**Critical Thinking**

- judge
- appraise
- evaluate
- rate
- compare
- value
- revise
- score
- select
- choose
- assess
- estimate
- measure
8. REQUIRED TEXTS:
Provide a representative list of textbooks and other required reading; include author, title and date of publication:


9. SUPPLEMENTARY READINGS:
Reading assignments may include, but are not limited to the following:

- Articles published in scientific journals

10. WRITING ASSIGNMENTS:
Title 5, section 55002 requires grades to be “based on demonstrated proficiency in subject matter and the ability to demonstrate that proficiency, at least in part, by means of essays or, in courses where the curriculum committee deems them to be appropriate, by problem solving exercises or skills demonstrations by students.” Writing assignments in this course may include, but are not limited to the following:

- Laboratory reports and written reports where experimental results are explained.

11. REPRESENTATIVE OUTSIDE ASSIGNMENTS:
Out of class assignments may include, but are not limited to the following:

- Students are required to do some literature search and compose papers. The assignments generally reinforce topics covered in class.

12. REPRESENTATIVE ASSIGNMENTS THAT DEMONSTRATE CRITICAL THINKING:
Title 5, section 55002(a) requires that a degree-applicable course have a level of rigor that includes “critical thinking and the understanding and application of concepts determined by the curriculum committee to be at college level”. Critical thinking may include, but is not limited to analysis, synthesis, and evaluation. Provide examples of assignments that demonstrate critical thinking.

- Students synthesize and isolate organic compounds using laboratory techniques learned in Chemistry 211.
- Students interpret data and compare and contrast experimental data with theory. An example of a critical thinking assignment is:
  - Starting with propylene oxide, propose a method for synthesizing 1-methoxy-2-propanol.

13. METHODS OF EVALUATION:
Title 5, section 55002 requires grades to be “based on demonstrated proficiency in subject matter and the ability to demonstrate that proficiency, at least in part, by means of essays, or, in courses where the curriculum committee deems them to be appropriate, by problem solving exercises or skills demonstrations by students.” Methods of evaluation may include, but are not limited to the following (please note that evaluation should measure the outcomes detailed “Course Objectives” at the beginning of Section II):

- Written examinations, laboratory reports, literature search reports, final exam
14. METHODS OF INSTRUCTION:
   Methods of instruction may include, but are not limited to the following:
   - Lecture
   - Discussion
   - Laboratory
   - Activity
   - Field Experience
   - Independent Study
   - Other (explain)

15. SUPPLIES:
   List the supplies the student must provide.
   Molecular models, laboratory notebook, scientific calculator, and safety goggles.

16. COMPUTER COMPETENCY:
   If applicable, explain how computer competency is included in the course.
   Chemical websites are used to obtain physical properties of organic compounds and review topics in organic chemistry. Students will use Chemdraw to draw molecules and use molecular mechanics to compare relative stabilities of organic molecules.

17. INFORMATION COMPETENCY:
   Information competency is the ability to find, evaluate use, and communicate information in all its various formats. It combines aspects of library literacy, research methods and technological literacy. Information competency includes consideration of the ethical and legal implications and requires the application of both critical thinking and communications skills. If applicable, explain how information competency is included in the course.

18. DIVERSITY:
   If applicable, explain how diversity (e.g., cultural, gender, etc.) is included in the course.
   This course is open to all students regardless of age, gender, and cultural differences.

19. SCANS COMPETENCIES (required for all courses with vocational TOP Codes; recommended for all courses):
   SCANS (Secretary’s Commission on Necessary Skills) are skills the Department of Labor identified, in consultation with business and industry leaders, which reflect the skills necessary for success in the workplace. Check the appropriate boxes to indicate the areas where students will develop the following skills (please note that all SCANS competencies do not apply to all courses):

   RESOURCES
   - Managing Time: Selecting relevant goal-related activities, ranking them in order of importance, allocating time to activities, and understanding, preparing and following schedules.
   - Managing Money: Using or preparing budgets, including making cost and revenue forecasts; keeping detailed records to track budget performance, and making appropriate adjustments.
Managing Material and Facility Resources: Acquiring, storing, allocating, and distributing materials, supplies, parts, equipment, space or final products in order to make the best use of them.

INTERPERSONAL

- Participating as Member of a Team: Working cooperatively with others and contributing to group’s efforts with ideas, suggestions and effort.
- Teaching Others New Skills: Helping others learn needed knowledge and skills.
- Exercising Leadership: Communicating thoughts, feelings, and ideas to justify a position, encouraging, persuading, convincing or otherwise motivating an individual or group, including responsibly challenging existing procedures, policies or authority.
- Negotiating: Working toward agreement that may involve exchanging specific resources or resolving divergent interests.
- Working with Cultural Diversity: Working well with men and women and with people from a variety of ethnic, social, or educational backgrounds.

INFORMATION

- Acquiring and Evaluating Information: Identifying a need for data, obtaining the data from existing sources or creating them, and evaluating their relevance and accuracy.
- Organizing and Maintaining Information: Organizing, processing and maintaining written or computerized records and other forms of information in a systematic fashion.
- Interpreting and Communicating Information: Selecting and analyzing information and communicating the results of others, using oral, written, graphic, pictorial, or multimedia methods.
- Using Computers to Process Information: Employing computers to acquire, organize, analyze and communicate information.

SYSTEMS

- Understanding Systems: Knowing how social, organizational and technological systems work and operating effectively with them.
- Monitoring and Correcting Performance: Distinguishing trends, predicting impacts of actions on system operations, diagnosing deviations in the functioning of a system/organization, and taking necessary steps to correct performance.
- Improving or Designs Systems: Making suggestions to modify existing systems in order to improve the quality of products or services and developing new or alternative systems.

TECHNOLOGY

- Selecting Technology: Judging which sets of procedures, tools or machines, including computers and their programs, will produce the desired results.
- Applying Technology to Tasks: Understanding overall intent and proper procedures for setting up and operating machines, including computers and their reprogramming systems.
- Maintaining and Troubleshooting Equipment: Preventing, identifying, or solving problems with equipment, including computers and other technologies.
Section III: RELATIONSHIP TO COLLEGE PROGRAMS

1. THIS COURSE WILL BE AN APPROVED REQUIREMENT FOR AN APPROVED ASSOCIATE DEGREE OR CERTIFICATE PROGRAM: \textbf{Yes}

\textbf{a.} If yes, the course will be a "\textit{restricted} elective" portion of the "approved program" listed on the State Chancellor’s Inventory of Approved Programs (approved programs can be found on the State Chancellor’s Office website at http://misweb.cccco.edu/esed/webproginv/prod/invmenu.htm)

| Biology #08442  
| Chemistry (tentative) |

\textbf{NOTE:} In order for a course to be approved as a requirement for an associate degree or certificate program, the program must be listed on the State Chancellor's Office Inventory of Approved Programs AND the course must be listed in the college catalog as either a requirement or an elective for the program. If course is not part of an approved program at the college adopting the course, it will be considered to be a "stand-alone" course, and is subject to the State Chancellor's approval criteria. The college must complete and submit the Chancellor’s Office “APPLICATION FOR APPROVAL OF CREDIT” form. Certain courses are granted “blanket approval” by the State Chancellor's Office and do not require separate approval. See the Chancellor's Office Program and Course Approval Handbook for details. LACCD Skills Certificates are not State approved programs and are not listed on the Chancellor's Office Inventory of Approved Programs.

2. GENERAL EDUCATION REQUIREMENTS FOR THE ASSOCIATE DEGREE STATUS:

\textbf{a. Area requested:} \textbf{a. Natural Science} \textbf{Approval date:} 11/16/04

If applicable, provide an explanation of how the course meets the General Education parameters for one of the five general education areas – Natural Sciences, Social and Behavioral Sciences, Humanities, Language and Rationality, Health and Physical Education -- contained in Board Rule 6201.14 -General Education Requirements. http://marlin.laccd.edu/district/BoardRules_AdmRegs/boardrules.htm

\textbf{a. 2\textsuperscript{nd} Area requested:} \textbf{None} \textbf{Approval date:}

If applicable, provide an explanation of how the course meets General Education parameters for an additional general education area – Natural Sciences, Social and Behavioral Sciences, Humanities, Language and Rationality, Health and Physical Education -- contained in Board Rule 6201.14 - General Education Requirements. http://marlin.laccd.edu/district/BoardRules_AdmRegs/boardrules.htm
Section IV: Articulation Information

(Complete in consultation with College Articulation Officer)

1. Transfer Status:
   a. Transferable to the University of California: requested
   b. UC approval date:
   c. Transferable to the California State University: Yes
   d. College approval date: 11/16/04

2. General Education for Transfer:

   IGETC Certification:
   a. Area requested: 5-A: Physical Sciences
   b. Date requested:
   c. IGETC approval date:
   
   If applicable, provide an explanation of how the course meets the appropriate General Education parameters, as defined in IGETC Certification Guidelines.

   CSU Certification:
   a. Area requested: B-1: Physical Science
   b. Date requested:
   c. CSU approval date:
   
   If applicable, provide an explanation of how the course meets the appropriate General Education parameters, as defined in CSU Certification Guidelines.

   a. 2nd Area requested: None
   b. Date requested:
   c. IGETC approval date:
   
   If applicable, provide an explanation of how the course meets the appropriate General Education parameters, as defined in IGETC Certification Guidelines.

   a. 2nd Area requested: B-3: Laboratory Activity
   b. Date requested:
   c. CSU approval date:
   
   If applicable, provide an explanation of how the course meets the appropriate General Education parameters, as defined in CSU Certification Guidelines.

3. Major Requirement for Transfer – Will this course be articulated to meet lower division major requirements?
   YES
   List college/university and the majors:

<table>
<thead>
<tr>
<th>College/University</th>
<th>Major(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSUN</td>
<td>Chemistry</td>
</tr>
</tbody>
</table>

   CAN NUMBER: CAN SEQUENCE NUMBER:
   CAN Approval -- Date requested: Date approved:
Section V: SUPPLEMENTAL COURSE INFORMATION

1. DEPARTMENT/DIVISION NAME: Natural Sciences, Health, & Physical Education

2. DEPARTMENT/DIVISION CODE: 07

3. SUBJECT CODE -- 3 characters, assigned by District Office: 183 (existing subject codes are available on the LACCD web site at http://www.laccd.edu/curriculum/directory-programs-courses/index.htm

4. SUBJECT ABBREVIATION -- 7 characters, assigned by District Office: CHEM

5. SPC CODE -- 3 characters, assigned by District Office:

6. ABBREVIATION FOR TRANSCRIPTS -- 20 characters, assigned by District Office: CHEM

7. DEGREE CREDIT: Indicate whether the course meet the “standards for approval” for degree credit course set forth in Title 5, section 55002(a)(2), which requires the course to have a degree of intensity, difficulty, and vocabulary that the curriculum committee has determined to be at the college level: This courses is Degree Applicable

8. CREDIT/NO CREDIT GRADING: No

9. REPETITIONS -- Number of times course may be repeated for credit (three maximum): 0

How does the repetition of this course meet Title 5, section 58161 requirements? A course may be repeatable when, “course content differs each time it is offered, and that the student who repeats it is gaining an expanded educational experience for one of the following reasons: (A) Skills or proficiencies are enhanced by supervised repetition and practice within class periods; or (B) Active participatory experience in individual study or group assignments is the basic means by which learning objectives are obtained.”

10. PRIOR TO TRANSFERABLE LEVEL – This course attribute applies to English, writing, ESL, reading and mathematics courses ONLY. If applicable, indicate how many levels below the transferable level this course should be placed: Not applicable

11. CREDIT BASIC SKILLS -- Title 5, section 5502(d) defines basic skills as “courses in reading, writing, computation, and English as a Second Language, which are designated as non-degree credit courses pursuant to Title 5, section 5502(b).” No If Yes, course must be non-degree applicable.

12. CROSS REFERENCE -- Is this course listed as equivalent in content to existing College/District courses in another discipline? No

If Yes, list courses (documentation of cross-discipline agreement must be provided):

13. COURSE SPECIFICALLY DESIGNED FOR STUDENTS WITH DISABILITIES -- Title 5, section 56029 allows a course to be repeatable when continuing success of the students with disabilities is dependent on additional repetitions of a specific class. Is this course designated as an “approved special class” for students with disabilities? No
If yes, provide an explanation of how this course meets the requirements of Title 5, section 56029.

14. COOPERATIVE EDUCATION STATUS -- Title 5, section 55252 allows for two types of Cooperative Education: 1) General Work Experience Education -- i.e., supervised employment, which is intended to assist students in acquiring desirable work habits, attitudes and career awareness, which need not be related to the students’ educational goals; or 2) Occupational Work Experience Education -- i.e., supervised employment, extending classroom based occupational learning at an on-the-job learning station, which is related to the students’ educational or occupational goal. Is this course part of the college’s approved cooperative work experience education program? **No**

15. COURSE CLASSIFICATION: **Liberal Arts Sciences**

Note: A course’s Classification, TOP Code and SAM code must be aligned – e.g., Courses with an “Occupational” Course Classification must have an “Occupational” TOP Code and a SAM Code of A, B, C, or D; courses that do not have an “Occupational” Course Classification cannot have an Occupational TOP Code and must have an “E” SAM Code. Courses coded as “basic skills” in #11 should be coded “Adult and Secondary Basic Skills.”

16. TOP CODE – (6 digits XXXX.XX) **1905.00**

Course content should match discipline description in Taxonomy of Programs found at www.cccco.edu/cccco/esed/curric/curriculum.htm.

17. SAM CODE (Student Accountability Model): **E - Non-Occupational**

SAM Codes (see CCC Chancellor’s Office Student Accountability Model Operations Manual, 1984) should be assigned as follows:

**Priority “A” – Apprenticeship:** Courses designed for an indentured apprentice must have the approval of the State of California, Department of Industrial Relations Department, Division of Apprenticeship Standards.

**Priority “B” – Advanced Occupational:** Courses taken by students in the advanced stages of their occupational programs. Courses should be offered in one specific occupational area only. Priority letter “B” should be assigned sparingly; in most cases, no more than two courses in any one program should be labeled “B.” “B”-level courses must have Priority “C” prerequisites in the same program area.

**Priority “C” – Clearly Occupational:** Courses generally taken by students in the middle stages of their programs should have a difficulty level sufficient to detract “drop-ins.” Courses may be offered in several occupational programs within a broad area. The “C” priority, however, should also be used for courses within a specific program area when the criteria for “B” classification are not met. A “C”-level course should provide the student with entry-level job skills.

**Priority “D” – Possibly Occupational:** “D” courses are those taken by students in the beginning stages of their occupational programs. The “D” priority can also be used for service (or survey) courses for other occupational programs.

**Priority “E” – Non-occupational.**
SECTION VI: APPROVAL STATUS

1. APPROVAL STATUS:

   a. ☐ New Course       . Board Approval Date:       . Effective Semester:       
   b. ☒ Addition of Existing District Course . College Approval Date: **11/04** . Effective Semester: **Fall 05**  
   c. ☐ Course Change* . College Approval Date:       . Effective Semester:       
   d. ☐ Outline Update . College Approval Date:       

* Changes to a course require the completion of a “Course Change Request” form and approval by the college's Curriculum Committee. In some cases districtwide approval is also required; see, Administrative Regulation E-65, section 3(c) for details.

SECTION VII: APPROVAL INFORMATION FOR NEW OR ADDED COURSES

(complete in consultation with Department Chair and the appropriate Academic Administrator)

1. ORIGINATOR: Glenn Yoshida and Pogban Toure

2. DEPARTMENT: Natural Sciences, Health, & P.E.

3. IF THIS IS A NEW COURSE, INDICATE HOW THE COLLEGE PLANS TO MEET THE EXPENSE OF THIS COURSE:

   ☐ By additional funds. Describe:

   ☐ By deleting courses from the college catalog and course database. List specific courses to be deleted:

   ☒ By deleting sections of existing courses. List courses and number of sections to be deleted:

     First year: **Chem 70**       Second year: **Chem 70**       Third year: **Chem 70**

   ☐ By rotating sections of existing courses. List courses and number of sections to be rotated, as well as the semesters in which they will be offered:

4. IMPACT -- Will this course directly impact other course offerings and/or associate degree or certificate programs on campus?  
   ☒ No (If yes, briefly explain how)

5. METHOD OF SUPPORT -- Indicate how the college plans to support the proposed course:

   Additional staff -- List additional staff needed:

   **0.6 FTEF Adjunct Faculty**
Classroom -- List classroom type needed:

LL403 (Chemistry Lab) and lecture room.

Equipment -- List new equipment needed and indicate funding source for any new equipment:

Will be obtained through Title V grant.

Supplies- List supplies and indicate dollar value:

Will be obtained through Title V grant.

Library/Learning Resources- The course initiator shall consult with the College Librarian and review the college library, book, periodical, and electronic resource collections relevant to this course. List additional titles and resources to be considered for purchase as funding permits:

6. **APPROPRIATENESS TO MISSION**—Describe how the objectives of the proposed course are consistent with the mission of the community colleges as established by the Legislature in the Education Code. The course should also be congruent with the mission statement of the local college and district.

This course fulfills a course requirement for transfer as Biology or Chemistry majors.

7. **NEED**—Demonstrate the need for the course that meets the stated objectives, at this time, and in the region. This course is needed to prepare students for continuing studies in chemistry, medicine, dentistry, and pharmacy.
# LOS ANGELES COMMUNITY COLLEGE DISTRICT
## COURSE STANDARDS AND CRITERIA

Subject: Chemistry  
Number: 212  
Course Title: Organic Chemistry for Science Majors II

Using the Official Course Outline, please determine whether or not the above listed credit course meets the following standards and criteria required in Title V, Part VI of the California Administrative Code, and which has been designated as appropriate to the Associate Degree. Place a (X) in the appropriate box.

<table>
<thead>
<tr>
<th>CRITERIA AND STANDARDS</th>
<th>RATING CRITERION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is recommended by the responsible college officials, and the academic senate or other</td>
<td>X</td>
</tr>
<tr>
<td>appropriate faculty body as meeting the requirements of this subsection and has been</td>
<td></td>
</tr>
<tr>
<td>approved by the local district governing board as a course meeting the needs of the</td>
<td></td>
</tr>
<tr>
<td>students for admission.</td>
<td></td>
</tr>
<tr>
<td>Is taught by a credentialed instructor in the discipline.</td>
<td>X</td>
</tr>
<tr>
<td>Is offered as described in an outline in official college files. That the outline shall</td>
<td>X</td>
</tr>
<tr>
<td>specify the unit value, scope, objectives, content in terms of a specific body of</td>
<td></td>
</tr>
<tr>
<td>knowledge, appropriate reading and writing assignments, outside of class assignments,</td>
<td></td>
</tr>
<tr>
<td>instructional methodology and methods of evaluation for determining whether the</td>
<td></td>
</tr>
<tr>
<td>stated objectives have been met by students.</td>
<td></td>
</tr>
<tr>
<td>Is taught in accordance with a set of instructional objectives common to all students.</td>
<td>X</td>
</tr>
<tr>
<td>Provides for measurement of students performance in terms of the stated course</td>
<td>X</td>
</tr>
<tr>
<td>objectives and culminates in a formal recorded grade based upon uniform standards in</td>
<td></td>
</tr>
<tr>
<td>accordance with Section 55578 of Title 5, which is permanently recorded as an evaluation</td>
<td></td>
</tr>
<tr>
<td>of student performance; bases grades on demonstrated proficiency in subject matter</td>
<td></td>
</tr>
<tr>
<td>determined by multiple measurement for evaluation; and has examinations, including</td>
<td></td>
</tr>
<tr>
<td>essays and/or, where appropriate, uses appropriate symbol systems and/or skills</td>
<td></td>
</tr>
<tr>
<td>demonstrations by students.</td>
<td></td>
</tr>
<tr>
<td>Grants units of credit based upon a specified relationship between the number of</td>
<td>X</td>
</tr>
<tr>
<td>lecture and/or laboratory hours or performance criteria specified in the course outline;</td>
<td></td>
</tr>
<tr>
<td>and requires a minimum of three hours of work per week including class time for each</td>
<td></td>
</tr>
<tr>
<td>unit of credit, prorated for short-term, lab and activity courses.</td>
<td></td>
</tr>
<tr>
<td>Treats subject matter with a scope and intensity which requires students to study</td>
<td>X</td>
</tr>
<tr>
<td>independently outside of class time.</td>
<td></td>
</tr>
<tr>
<td>Requires, when appropriate, entrance skills and consequent prerequisites for the course</td>
<td>X</td>
</tr>
<tr>
<td>before students are enrolled.</td>
<td></td>
</tr>
<tr>
<td>Requires the ability to think critically and to understand and apply concepts in order</td>
<td>X</td>
</tr>
<tr>
<td>to participate in the course.</td>
<td></td>
</tr>
<tr>
<td>Requires learning skills and a vocabulary appropriate for a college course.</td>
<td>X</td>
</tr>
<tr>
<td>Requires the use of college level educational materials.</td>
<td>X</td>
</tr>
</tbody>
</table>
CONTENT REVIEW FOR PREREQUISITE VALIDATION

Chemistry 212—Organic Chemistry for Science Majors II
(Course to which pre/corequisite/advisory applies)

☐ Prerequisite: Chemistry 211—Organic Chemistry for Science Majors I
☐ Corequisite:
☐ Advisory:
☐ Assessment

A. Target Course Entry Skills: Chemistry 212—Organic Chemistry for Science Majors II
(For prerequisites/corequisites, list specific skills and/or knowledge necessary for students to succeed in the target class. For advisories, list skills/knowledge which will enrich or deepen the student's knowledge obtained from the course but without which the student may still succeed in the course. Attach additional sheet if necessary. NUMBER EACH SKILL.)

Before entering the course, the student should be able to:

1. Write Lewis and resonance structures of organic compounds.
2. Apply principles of valence bond theory and molecular orbital theory—hybridization, resonance, electronegativity and polarity and formal charge to problems of molecular structure.
3. Explain the reaction kinetics and mechanisms of simple organic reactions such as nucleophilic substitution and elimination reactions.
4. Determine the structures of organic molecules using IR and NMR spectroscopy.
5. Predict the IR and NMR spectra of molecules given their structures.
6. Apply retrosynthetic techniques in the synthesis of organic molecules.
7. Use stereochemistry in explaining structure and reactivity in organic molecules.
8. Name alkanes, haloalkanes, alkenes and alcohols by the IUPAC system.
9. Collect and analyze scientific data, including the use of graphical methods.

B. Exit Skills Provided By Prerequisite/Corequisite/Advisory Course or Assessment:
Chemistry 211 – Organic Chemistry for Science Majors I
(List specific skills and/or knowledge that are the outcome of the prerequisite/corequisite/advisory course or assessment. For courses already in the curriculum, these should be present in the course objectives in the course outline. Attach additional sheet if necessary. NUMBER EACH SKILL.)

Upon the completion of the course, the student should be able to:

1. Draw Lewis, VSEPR, and resonance structures of organic molecules.
2. Describe structures and properties of organic molecules.
3. Describe bonding in organic molecules.
4. Describe structure and stereochemistry of alkanes.
5. Calculate free energies and equilibria of organic reactions.
6. Explain the reaction kinetics and mechanisms of simple organic reactions (e.g., nucleophilic substitutions).
7. Use IR and NMR spectroscopy to determine the structures and functional groups of molecules.
8. Apply retrosynthetic techniques in formulating the synthesis of organic molecules.
9. Collect and analyze experimental data.
## CONTENT REVIEW SKILLS MATRIX FOR PREREQUISITE VALIDATION

**Chemistry 212**  
Organic Chemistry for Science Majors II  
Entering Skills of Target Course

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

### Comments:
(Include justification for assessments, health and safety, or non-course prerequisites)

**Total Number of Matches:** 12  
(of possible 81)  
(Validation requires at least one match of each entry skill with one or more exit skills.)

### PARTICIPANTS IN CONTENT REVIEW:
(Signatories should include instructors for both exit and entering skills courses.)

- **Name:** Pogban Toure  
  **Title:** Adjunct Faculty  
  **Initial:** PT  
  **Date:** ______

- **Name:**  
  **Title:**  
  **Initial:**  
  **Date:** ______

- **Name:**  
  **Title:**  
  **Initial:**  
  **Date:** ______

### CERTIFIED BY:

<table>
<thead>
<tr>
<th>Initiator</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glenn Yoshida</td>
<td>06/15/05</td>
</tr>
<tr>
<td>Department Chairperson</td>
<td>Date</td>
</tr>
<tr>
<td>Glenn Yoshida</td>
<td>06/15/05</td>
</tr>
<tr>
<td>Curriculum Chairperson</td>
<td>Date</td>
</tr>
</tbody>
</table>
CERTIFICATION AND RECOMMENDATION

☒ This course meets Title 5 requirements for Associate Degree applicable college credit towards an Associate of Arts Degree.
☐ This course meets Title 5 requirements but does not satisfy the requirements for an Associate Degree applicable course.

We certify that the information and answers above properly represent this course.

Glenn Yoshida
Originator
06/15/05

Glenn Yoshida
Department/Cluster Chairperson
06/15/05

Linda Larson Singer
Articulation Officer
07/05/05

Shelley Werts
Librarian
06/30/05

Earnestine Thomas-Robertson
Dean (if applicable)
06/22/05

Glenn Yoshida
Curriculum Committee Chairperson
06/15/05

Reggie Morris
Academic Senate President
06/20/05

Leige Henderson
Vice President, Academic Affairs
06/22/05

Audre Levy
College President
06/23/05
DATA INPUT PAGES
(Fills Automatically from Other Pages)

COLLEGE:

APPROVAL STATUS:

<table>
<thead>
<tr>
<th>New Course</th>
<th>Board Approval Date:</th>
<th>Effective Semester:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Addition of Existing District Course</th>
<th>College Approval Date: 11/16/04</th>
<th>Effective Semester: Fall 2005</th>
</tr>
</thead>
</table>

DEPARTMENT/DIVISION NAME: Natural Sciences, Health, & Physical Education

DEPARTMENT/DIVISION CODE: 07

SUBJECT (DISCIPLINE) NAME: Chemistry

SUBJECT CODE -- 3 characters, assigned by District Office: 183

SUBJECT ABBREVIATION -- 7 characters, assigned by District Office: Chem

COURSE TITLE: Organic Chemistry for Science Majors II

COURSE NUMBER: 212

UNITS: 5

CLASS HOURS:

<table>
<thead>
<tr>
<th>Hours per week (based on 18 weeks)</th>
<th>Total Hours per term (hrs per week x 18)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture:</td>
<td>54</td>
<td>3</td>
</tr>
<tr>
<td>Lab/activity (w/ homework):</td>
<td>Error! Reference source not found.</td>
<td></td>
</tr>
<tr>
<td>Lab/activity (w/o homework):</td>
<td>Error! Reference source not found.</td>
<td>Error! Reference source not found.</td>
</tr>
<tr>
<td>Total:</td>
<td>162</td>
<td>5</td>
</tr>
</tbody>
</table>

DEGREE CREDIT: Indicate whether the course meet the “standards for approval” for degree credit course set forth in Title 5, section 55002(a)(2), which requires the course to have a degree of intensity, difficulty, and vocabulary that the curriculum committee has determined to be at the college level:

This course is Degree Applicable

THIS COURSE WILL BE AN APPROVED REQUIREMENT FOR AN APPROVED ASSOCIATE DEGREE OR CERTIFICATE PROGRAM:
If yes, the course will be a "restricted" elective portion of the “approved program” listed on the State Chancellor’s Inventory of Approved Programs (approved programs can be found on the State Chancellor’s Office website at

**GENERAL EDUCATION FOR TRANSFER:**

<table>
<thead>
<tr>
<th>Area requested</th>
<th>Approval date</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Natural Science</td>
<td></td>
</tr>
</tbody>
</table>

**GENERAL EDUCATION REQUIREMENTS FOR THE ASSOCIATE DEGREE STATUS:**

<table>
<thead>
<tr>
<th>Area requested</th>
<th>Approval date</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Natural Science</td>
<td>11/16/04</td>
</tr>
<tr>
<td>2nd Area requested</td>
<td>Approval date</td>
</tr>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

**TRANSFER STATUS:**

- Transferable to the University of California: UC approval date:

- Transferable to the California State University: College approval date: 11/16/04

**GENERAL EDUCATION FOR TRANSFER:**

**IGETC**

<table>
<thead>
<tr>
<th>Area requested</th>
<th>Date requested</th>
<th>IGETC approval date</th>
</tr>
</thead>
<tbody>
<tr>
<td>5A</td>
<td>12/05</td>
<td>pending</td>
</tr>
</tbody>
</table>

**CSU CERTIFICATION**

<table>
<thead>
<tr>
<th>Area requested</th>
<th>Date requested</th>
<th>CSU Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1, B-3</td>
<td>12/05</td>
<td>pending</td>
</tr>
</tbody>
</table>

**ABBREVIATION FOR TRANSCRIPTS** -- 20 characters, assigned by District Office: Chemistry

**COURSE CLASSIFICATION:**

**TOP CODE** – (6 digits xxxx.xx) 1905.

**SAM CODE** (Student Accountability Model): E-Non Occupational

**PREREQUISITES, COREQUISITES, ADVISORIES ON RECOMMENDED PREPARATION, and LIMITATION ON ENROLLMENT**

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>Corequisite</th>
<th>CREDIT/NO CREDIT GRADING</th>
<th>REPETITIONS</th>
<th>CROSS REFERENCE</th>
<th>CREDIT BASIC SKILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>None</td>
<td>No</td>
<td>0</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

If Yes, course must be non-degree applicable
COURSE SPECIFICALLY DESIGNED FOR STUDENTS WITH DISABILITIES -- Title 5, section 56029 allows a course to be repeatable when continuing success of the students with disabilities is dependent on additional repetitions of a specific class. Is this course designated as an "approved special class" for students with disabilities? No

APPROVAL STATUS:

New Course

Board Approval Date: 
Effective Semester: 

Addition of Existing District Course

College Approval Date: 

COOPERATIVE EDUCATION STATUS -- Title 5, section 55252 allows for two types of Cooperative Education: 1) General Work Experience Education -- i.e., supervised employment, which is intended to assist students in acquiring desirable work habits, attitudes and career awareness, which need not be related to the students' educational goals; or 2) Occupational Work Experience Education -- i.e., supervised employment, extending classroom based occupational learning at an on-the-job learning station, which is related to the students' educational or occupational goal. Is this course part of the college's approved cooperative work experience education program? No

CATALOG COURSE DESCRIPTION -- Provide a description of the course, including an overview of the topics covered:

This course is a continuation of the study of organic compounds that started with Chemistry 211. Emphasis is placed on the synthesis of organic compounds and mechanisms of organic reactions. Topics on organic molecules of biological importance such as amino acids, peptides and carbohydrates are also covered. The laboratory work focuses on the synthesis, isolation, purification, and instrumental analysis of organic compounds.

CLASS SCHEDULE COURSE DESCRIPTION -- Provide a brief description of the course, including an overview of the topics covered:

This course is a continuation of the study of organic compounds that started with Chemistry 211. Emphasis is placed on the synthesis of organic compounds and mechanisms of organic reactions.

SPC CODE -- 3 characters, assigned by District Office: