I. CATALOG INFORMATION

A. Discipline: CHEMISTRY

B. Subject Code and Number: CHEM M07A

C. Course Title: Organic Chemistry I

D. Credit Course units:
   Units: 5
   Lecture Hours per week: 3
   Lab Hours per week: 6
   Variable Units: No

E. Student Learning Hours:
   Lecture Hours:
   Classroom hours: 52.5 - 52.5
   Laboratory/Activity Hours:
   Laboratory/Activity Hours 105 - 105

Total Combined Hours in a 17.5 week term: 157.5 - 157.5

F. Non-Credit Course hours per week __________

G. May be taken a total of: X 1 2 3 4 time(s) for credit

H. Is the course co-designated (same as) another course: No X Yes
   If YES, designate course Subject Code & Number: __________

I. Course Description:

Emphasizes molecular structure, chemical and physical properties, and the preparation and reactivities of organic molecules with an emphasis on reaction mechanisms, synthesis, structure determination, and applications. Involves, through laboratory work, the use of appropriate methods, techniques, and instrumentation for the synthesis, purification and identification of organic compounds discussed in the lecture portion.

J. Entrance Skills

*Prerequisite: No [ ] Yes X Course(s)
   CHEM M01B, equivalent college course with a C or higher. or

*Corequisite: No X Yes [ ] Course(s)

Limitation on Enrollment: No X Yes [ ]

Recommended Preparation: No X Yes [ ] Course(s)

Other: No X Yes [ ]
K. Other Catalog Information:

Course requires use of a lab coat and goggles. C-ID: CHEM 150 & CHEM 160S

II. COURSE OBJECTIVES

Upon successful completion of the course, a student will be able to:

<table>
<thead>
<tr>
<th>Course Objective</th>
<th>Methods of evaluation will be consistent with, but not limited by, the following types or examples</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>describe how various organic molecules are used in medicine, industry, and the household and how their use impacts daily life and draw correct Lewis structures for a wide variety of main-group compounds, identify hybrid and molecular orbitals utilized in bonding, and convert formulas into various three dimensional structural representations including skeletal (bond-line) structures and resonance hybrids.</td>
</tr>
<tr>
<td>2.</td>
<td>name cyclic and acyclic compounds containing alcohols, halides, alkenes and alkynes using the IUPAC (International Union of Pure and Applied Chemistry) system, name small compounds using common (e.g., iso, sec-, tert-) prefixes, identify and name compounds containing common functional groups such as halides, alkenes, alkynes, carbonyl groups, alcohols, amines, aromatic rings and ethers.</td>
</tr>
<tr>
<td>3.</td>
<td>identify conformational isomers, draw Newman projections and cyclohexane chair forms that accurately portray axial and equatorial groups, and predict which Newman projection and chair form will be most stable and least stable.</td>
</tr>
<tr>
<td>4.</td>
<td>identify stereoisomers, label a stereocenter using the Cahn-Ingold-Prelog rules, distinguish between and define the terms enantiomer, diastereomer, meso, chiral and achiral, and provide examples of chiral molecules without stereocenters.</td>
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<tr>
<td>5.</td>
<td>predict both the magnitude and direction of the polarity of organic molecules, identify intermolecular forces between organic molecules, and understand how intermolecular forces influence boiling point, solubility, nucleophilicity, and reactivity of organic compounds.</td>
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<tr>
<td></td>
<td>predict the course of any acid-base reaction based on pKₐ values and organic structures, rank common functional groups in order of their pKₐ values, draw “electron arrows” to indicate</td>
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http://www.curricunet.com/moorpark/reports/course_outline_html.cfm?courses_id=3348
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<tbody>
<tr>
<td>6</td>
<td>the flow of electrons in Lewis acid-base reactions, and identify various reagents that will quantitatively deprotonate an alcohol and an alkyne.</td>
<td>written expression of results and conclusions, cumulative final exam.</td>
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<tr>
<td>7</td>
<td>draw the mechanism and predict the products of inter- and intramolecular nucleophilic substitution (S\text{N}) reactions, including stereocenter inversion during an S\text{N}\text{2} reaction, racemization of stereochemistry during an S\text{N}\text{1} reaction, and carbocation rearrangements. Students should be able to rank carbocations in the correct order of stability and list various groups in order of their nucleophilicity and use these skills to rank the rate of similar S\text{N} reactions that vary in the nature of the substrate.</td>
<td>quizzes, examinations, laboratory-based applications (including written expression of results and conclusions), cumulative final exam.</td>
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<tr>
<td>8</td>
<td>use Zaitsev’s rule to predict which alkenes will be most stable, label alkenes as \textit{E} or \textit{Z} using the Cahn-Ingold-Prelog rules, predict whether a given nucleophile will give predominately elimination or substitution in a reaction, draw the mechanisms of E2 and E1 reactions, and use this information to predict the major and minor products of substitution and elimination reactions of electrophiles bearing a leaving group.</td>
<td>quizzes, examinations, laboratory-based applications (including written expression of results and conclusions), cumulative final exam.</td>
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<tr>
<td>9</td>
<td>draw the mechanism and predict the products of addition reactions to alkenes and alkynes including reactions that demonstrate the stereochemical ramifications of the addition of halogens and hydrohalogens (in the presence and absence of water), the difference between acid-catalyzed hydration and hydroboration as methods of adding hydroxy groups, and the consequences of tautomerization to the enol products formed during hydration of alkynes.</td>
<td>quizzes, examinations, laboratory-based applications (including written expression of results and conclusions), cumulative final exam.</td>
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<tr>
<td>10</td>
<td>draw the mechanism and predict the products of redox reactions of alkenes and alkynes, including epoxidation, stereoselective dihydroxylation, ozonolysis, catalytic hydrogenation, and stereoselective reduction of alkynes to \textit{cis} and \textit{trans} alkenes. Also, plan synthetic strategies using alkynyl nucleophiles.</td>
<td>quizzes, examinations, laboratory-based applications (including written expression of results and conclusions), cumulative final exam.</td>
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<tr>
<td>11</td>
<td>draw the mechanism and predict the products of substitution, elimination, and redox reactions of alcohols, ethers, and epoxides, including the Williamson ether synthesis, dehydration reactions catalyzed by acids and other reagents, conversions of alcohols to alkyl halides using hydrohalogens and other reagents, tosylate formation, oxidations of alcohols to form aldehydes, carboxylic acids, and ketones, acid-catalyzed decomposition of ethers, and the stereochemical ramifications of epoxide-opening reactions in the presence and absence of acid catalysts.</td>
<td>quizzes, examinations, laboratory-based applications (including written expression of results and conclusions), cumulative final exam.</td>
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<tr>
<td>12</td>
<td>explain the use of infrared spectroscopy and mass spectrometry in the determination of organic chemical structure, identify specific functional groups from IR spectral data, and use IR and MS data to make determinations about organic structures.</td>
<td>quizzes, examinations, laboratory-based applications (including written expression of results and conclusions), cumulative final exam.</td>
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<tr>
<td>13</td>
<td>identify the causes and origins of the nuclear magnetic resonance (NMR) effect, correlate chemical shifts in NMR spectra with structure and predict the integrations, positions and peak splitting of signals in proton spectroscopy, and be able to both predict the NMR spectra given structure of compounds and to deduce their structure based on spectral data.</td>
<td>quizzes, examinations, laboratory-based applications (including written expression of results and conclusions), laboratory results (including identification of unknown samples, and purity and yield of synthesized samples).</td>
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<td>14</td>
<td>separate and purify compounds using recrystallizations, simple, fractional, and steam distillations, extractions (including acid-base extractions), filtrations, and chromatography (including gas chromatography, GC, and thin layer chromatography, TLC) and determine purity and identity of samples through the use of melting point, infrared spectroscopy, and NMR spectroscopy.</td>
<td>quizzes, examinations, laboratory-based applications (including written expression of results and conclusions), laboratory results (including identification of unknown samples, and purity and yield of synthesized samples).</td>
</tr>
<tr>
<td>15</td>
<td>demonstrate safe laboratory practice while synthesizing organic compounds by refluxing reactants, isolate these compounds, qualitatively and quantitatively determine the success of the reaction, record results in a properly formatted laboratory notebook, and report results.</td>
<td>quizzes, examinations, laboratory-based applications (including written expression of results and conclusions), laboratory results (including identification of unknown samples, and purity and yield of synthesized samples).</td>
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</table>

### III. COURSE CONTENT

<table>
<thead>
<tr>
<th>Estimated %</th>
<th>Topic</th>
<th>Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture (must total 100%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.00%</td>
<td>Structure and Bonding: Lewis structures, octet violators, isomerism, resonance forms, molecular geometry, bond-line notation, hybridization, formal charges, bond length, bond strength, electronegativity, and polarity.</td>
<td>1, 5</td>
</tr>
<tr>
<td>3.00%</td>
<td>Introduction to Organic Molecules: Functional groups and intramolecular forces.</td>
<td>5, 14</td>
</tr>
<tr>
<td>7.00%</td>
<td>Alkanes: Common and IUPAC nomenclature, cis/trans isomers of substituted ring compounds, physical properties, Newman projections, and chair conformations.</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>7.00%</td>
<td>7.00%</td>
<td>12.00%</td>
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</tbody>
</table>
### IV. TYPICAL ASSIGNMENTS

**A. Writing assignments**

Writing assignments are required. Possible assignments may include, but are not limited to:

1. preparation of a laboratory notebook that will detail the work completed in the laboratory section of the course.
2. written reports of laboratory results.
3. short answer questions on exams asking for descriptions, examples, or definitions.
4. analysis of popular articles about organic chemistry that appear in the general media.

**B. Appropriate outside assignments**

Appropriate outside assignments are required. Possible assignments may include, but are not limited to:

1. reading material from the textbook and laboratory manual.
2. take-home laboratory assignments.
3. homework problems selected from the textbook.
4. additional problem sets provided by the instructor.
5. readings from the newspaper, journal articles, and/or Internet sources.
Critical thinking assignments are required. Possible assignments may include, but are not limited to:

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>in-class discussions of selected example homework problems and methods of problem solving.</td>
</tr>
<tr>
<td>2</td>
<td>propose mechanisms for transformations that are grounded on precedent and good chemical logic.</td>
</tr>
<tr>
<td>3</td>
<td>lab assignments designed to make students elucidate answers rather than repeating previous work.</td>
</tr>
<tr>
<td>4</td>
<td>development of synthetic schemes that will produce pure products without production of by-products.</td>
</tr>
</tbody>
</table>

V. METHODS OF INSTRUCTION
Methods of instruction may include, but are not limited to:

- [x] Distance Education – When any portion of class contact hours is replaced by distance education delivery mode (Complete DE Addendum, Section XV)
- [x] Lecture/Discussion
- [x] Laboratory/Activity
- [x] Other (Specify)
  Chemical demonstrations performed by instructor, student group work, online tutorials, homework, and study aids

Optional Field Trips
Required Field Trips

VI. METHODS OF EVALUATION
Methods of evaluation may include, but are not limited to:

- [ ] Essay Exam
- [x] Problem Solving Exam
- [x] Objective Exams
- [x] Classroom Discussion
- [x] Reports/Papers/Journals
- [x] Skill Demonstration
- [x] Participation
- [x] Projects
- [x] Other (specify)

Multi-week lab experiment with formal report
Online homework with standardized grading through textbook publisher that allows comparisons to national norms

VII. REPRESENTATIVE TEXTS AND OTHER COURSE MATERIALS
Smith, Janice Gorzynski, and Erin Smith Berk. Student Study Guide/Solutions Manual to


Prentice Hall Molecular Model Set for Organic Chemistry.

VIII. STUDENT MATERIALS FEES

☒ No ☐ Yes

IX. PARALLEL COURSES

<table>
<thead>
<tr>
<th>College</th>
<th>Course Number</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>UC Los Angeles</td>
<td>CHEM 30A</td>
<td>Organic Chemistry I: Structure and Reactivity</td>
<td>4</td>
</tr>
<tr>
<td>UC Irvine</td>
<td>CHEM 51A &amp; 51A</td>
<td>Organic Chemistry and Organic Chemistry Laboratory</td>
<td>4/2</td>
</tr>
<tr>
<td>San Diego State Univ.</td>
<td>CHEM 232 &amp; 232L</td>
<td>Organic Chemistry &amp; Lab</td>
<td>3/1</td>
</tr>
<tr>
<td>CSU Sacramento</td>
<td>CHEM 24 &amp; 25</td>
<td>Organic Chemistry Lecture I + Lab</td>
<td>3/3</td>
</tr>
<tr>
<td>Oxnard College</td>
<td>CHEM R130</td>
<td>Organic Chemistry I</td>
<td>5</td>
</tr>
<tr>
<td>Ventura College</td>
<td>CHEM V12A &amp; V12AL</td>
<td>General Organic Chemistry I &amp; Lab</td>
<td>3/2</td>
</tr>
<tr>
<td>UC Merced</td>
<td>CHEM 8</td>
<td>Principles of Organic Chemistry</td>
<td>4</td>
</tr>
</tbody>
</table>

X. MINIMUM QUALIFICATIONS

Courses Requiring a Masters Degree:
Master’s degree in chemistry OR bachelor’s degree in chemistry or biochemistry AND master’s degree in biochemistry, chemical engineering, chemical physics, physics, molecular biology, or geochemistry OR the equivalent.

XI. ARTICULATION INFORMATION

A. Title V Course Classification:
   1. This course is designed to be taken either:
      ☒ Pass/No Pass only (no letter grade possible); or
      ☒ Letter grade (P/NP possible at student option)

   2. Degree status:
      Either ☒ Associate Degree Applicable; or ☐ Non-associate Degree Applicable

B. Moorpark College General Education:
   1. Do you recommend this course for inclusion on the Associate Degree General Education list?
      Yes: ☒ No: ☐ If YES, what section(s)?

      ☒ A1 - Natural Sciences - Biological Science
      ☒ A2 - Natural Sciences - Physical Science
      ☒ B1 - Social and Behavioral Sciences - American History/Institutions
      ☒ B2 - Social and Behavioral Sciences - Other Social Behavioral Science
C. California State University (CSU) Articulation:

1. Do you recommend this course for transfer credit to CSU? Yes: [X] No: [ ]

2. If YES do you recommend this course for inclusion on the CSU General Education list? Yes: [X] No: [ ] If YES, which area(s)?

   C1 [ ] C2 [ ] D1 [ ] D2 [ ] D3 [ ] D4 [ ] D5 [ ]
   D6 [ ] D7 [ ] D8 [ ] D9 [ ] D10 [ ] E [ ]

D. University of California (UC) Articulation:

1. Do you recommend this course for transfer to the UC? Yes: [X] No: [ ]

2. If YES do you recommend this course for the Intersegmental General Education Transfer Curriculum (IGETC)? Yes: [X] No: [ ]

   IGETC Area 1: English Communication
   - [ ] English Composition
   - [ ] Critical Thinking - English Composition
   - [ ] Oral Communication

   IGETC Area 2: Mathematical Concepts and Quantitative Reasoning
   - [ ] Mathematical Concepts

   IGETC Area 3: Arts and Humanities
   - [ ] Fine Arts
   - [ ] Humanities

   IGETC Area 4: Social and Behavioral Sciences
   - [ ] Anthropology and Archaeology
   - [ ] Economics
   - [ ] Ethnic Studies
   - [ ] Gender Studies
   - [ ] Geography
determine how rates of chemical reactions are measured, written, and used to deduce probable reaction mechanisms as well as describe the transition state and collision theory of reactions that produce effective collisions.

2. write and solve equilibrium constant expressions for chemical reactions, calculate final equilibrium values of a reaction from a variety
of initial conditions, and apply Le Chatelier's Principle to various mixtures.

3. state the general principles of Arrhenius, Bronsted-Lowry, and Lewis acid/base theories, explain the nature of the pH scale as well as perform a multitude of pH calculations, plot and analyze titration curves, solve quantitative buffer solution problems using the Henderson-Hasselbalch equation, calculate the value of all equilibrium species for a polyprotic acid, and predict the relative strengths of binary and oxoacids.

4. define solubility equilibria and use the law of mass action to write equilibrium expressions, perform equilibrium calculations involving the solubility product constant, predict if precipitates will form upon mixing ionic solutions of various concentrations, identify complex ions, write equilibrium formation and dissociation reactions, calculate equilibrium values for complex ion solutions, and calculate the solubility of slightly soluble solutes in solutions involving the formation of complex ions.

5. apply the principles of acid/base and solubility equilibria in quantitative and qualitative chemical analyses.

6. state and apply the First, Second, and Third Laws of Thermodynamics along with Hess's Law, calculate heats of reactions using coffee-cup and bomb calorimeters, and quantitatively incorporate the concepts of work and internal energy.

7. define entropy, Gibbs Free Energy, and calculate changes in entropy and Gibbs Free energy in a chemical reaction for standard and nonstandard state conditions in order to determine overall spontaneity.

8. correlate the combined concepts of equilibrium, free energy change, and cell potential.

9. distinguish between and note the properties of various organic compounds including functional group recognition, draw resonance structures for a molecule or ion and utilize the curved arrow formalism within a given mechanism, and identify major products in certain organic chemistry reactions.

10. conduct various quantitative and qualitative experiments with adherence to safety protocols, record observations and express numerical values appropriately, analyze acquired data, and formulate proper conclusions through written expression of results.

- B. Standard Prerequisite or Corequisite required by universities.
- C. Corequisite is linked to companion lecture course.
- D. Prerequisite or Corequisite is authorized by legal statute or regulation.

Code Section: ___________
☐ E. Prerequisite or Corequisite is necessary to protect the students' health and safety.

☐ F. Computation or communication skill is needed.

☐ G. Performance courses: Audition, portfolio, tryouts, etc. needed.

Requisite Justification for equivalent college course with a C or higher.

☐ A. Sequential course within a discipline.

☐ B. Standard Prerequisite or Corequisite required by universities.

☐ C. Corequisite is linked to companion lecture course.

☐ D. Prerequisite or Corequisite is authorized by legal statute or regulation.
   Code Section: __________

☐ E. Prerequisite or Corequisite is necessary to protect the students' health and safety.

☐ F. Computation or communication skill is needed.

☐ G. Performance courses: Audition, portfolio, tryouts, etc. needed.

or

XIV. WORKPLACE PREPARATION

CHEM M07A: Not Applicable

XV. DISTANCE LEARNING COURSE OUTLINE ADDENDUM

1. Mode of Delivery

☐ Online (course will be delivered 100% online)

☐ Online with onsite examinations (100% of the instruction will occur online, but examinations and an orientation will be scheduled onsite)

☒ Online/Hybrid (a percentage of instruction will be held online and the remaining percentage of instruction will be held onsite)

☒ Lab activities will be conducted onsite

☐ Televideo (Examinations and an orientation will be held onsite)

☐ Teleconference
2. Need/Justification

Improve general student access.

3. Describe how instructors teaching this course will ensure regular, effective contact with and among students.

Synchronous and asynchronous contact will be maintained with students through online live classroom presentations, discussion board and chat room interactions, and weekly onsite lectures and laboratory sessions.

4. Describe how instructors teaching this course will involve students in active learning.

This course will be taught with 40% onsite and 60% online. The onsite consists of the college technological platform and overall course introduction, three to four written examinations plus cumulative final exam, hands-on laboratories, and multiple discussion sections. The online consists of discussion board and chat room interactions, possible virtual lab demonstrations, and class-wide emails as well as individual student emails to maintain a constant ambience of active learning.

5. Explain how instructors teaching this course will provide multiple methods of content representation.

Students will have access to all lecture notes and are responsible for printing these prior to class for notetaking. Students will learn onsite through initial course orientation, learn about the selected college-wide technological platform and its usage in the course, take three to four examinations plus the cumulative final exam, and conduct all labs onsite. Instructors may also choose to include audio and video files to supplement lecture material online.

6. Describe how instructors teaching this course will evaluate student performance.

Student grades will be evaluated similar to a traditionally taught course. For example: quizzes (20%), online participation and discussion questions (10%), examinations (50%), and laboratory experiment reports (20%).

XVI. General Education Course Outline Addendum

General Education Division of Learning [check all applicable boxes]:

- Natural Sciences
- Biological Science
- Physical Science
- Social and Behavioral Sciences
- American History/Institutions
- Other Social Science
- Humanities
- Fine or Performing Arts
☐ Other Humanities
☐ Language and Rationality
☐ English Composition
☐ Communication and Analytical Thinking
☐ Health/Physical Education
☐ Ethnic/Women's Studies

Check either Option 1 or Option 2

☐ OPTION #1: Moorpark College has already received approval from the CSU and/or UC systems for this course to fulfill a GE requirement. Note: This option applies only to technical revisions and updated courses.

☐ OPTION #2: Moorpark College has not received approval from the CSU and/or UC systems for this course to fulfill a GE requirement. This option applies to all new and substantively revised courses.

XVII. Student Materials Fee Addendum

CHEM M07A: Not Applicable

XVIII. Repeatability Justification Title 5, Section 55041

CHEM M07A: Not Applicable

XIX. CURRICULUM APPROVAL

A. Course Information:
   1. Discipline: CHEMISTRY
   2. Discipline Code and Number: CHEM M07A
   3. Course Revision Category: Outline Update

B. Course Proposed By:
   1. Originating Faculty: Deanna Franke 10/30/2012
   2. Faculty Peer: Robert Keil 10/31/2012
   4. Department Chair: Robert Keil 10/31/2012
   5. Division Dean: Lisa Miller 10/31/2012

C. Approved By:
   Curriculum Chair: Mary Rees 12/07/2012
   Executive Vice President: Jane Harmon 11/20/2012
   Articulation Officer: Letrishia Mai 11/13/2012
   Librarian: Mary LaBarge 11/13/2012

D. Implementation Term and Year: Fall 2013
E. Approval Dates:
   1. Approved by Moorpark College Curriculum Committee: 12/04/2012
   2. Approved by Board of Trustees (if applicable): _________
   3. Approved by State (if applicable): _________