

# CHEM R112: ELEMENTARY ORGANIC AND BIOLOGICAL CHEMISTRY

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**Originator**

yma

**College**

Oxnard College

**Discipline (CB01A)**

CHEM - Chemistry

**Course Number (CB01B)**

R112

**Course Title (CB02)**

Elementary Organic and Biological Chemistry

**Banner/Short Title**

Elementary Org &amp; Biochemistry

**Credit Type**

Credit

**Start Term**

Fall 2021

**Catalog Course Description**

The major emphasis of this course will be on general organic chemistry and biological chemistry as they apply to the living systems. The section of organic chemistry includes naming, structure and bonding, classification by functional groups and reactions, polymerization, optical isomerism, and physical properties based on molecular polarity. Biochemistry includes carbohydrates, proteins, and amino acids, fats, enzymes, DNA and RNA, and cell biochemistry. The lab illustrates the principles covered in the lecture.

**Taxonomy of Programs (TOP) Code (CB03)**

1905.00 - Chemistry, General

**Course Credit Status (CB04)**

D (Credit - Degree Applicable)

**Course Transfer Status (CB05) (select one only)**

A (Transferable to both UC and CSU)

**Course Basic Skills Status (CB08)**

N - The Course is Not a Basic Skills Course

**SAM Priority Code (CB09)**

E - Non-Occupational

**Course Cooperative Work Experience Education Status (CB10)**

N - Is Not Part of a Cooperative Work Experience Education Program

**Course Classification Status (CB11)**

Y - Credit Course

**Educational Assistance Class Instruction (Approved Special Class) (CB13)**

N - The Course is Not an Approved Special Class

**Course Prior to Transfer Level (CB21)**

Y - Not Applicable

**Course Noncredit Category (CB22)**

Y - Credit Course

**Funding Agency Category (CB23)**

Y - Not Applicable (Funding Not Used)

**Course Program Status (CB24)**

1 - Program Applicable

**General Education Status (CB25)**

Y - Not Applicable

**Support Course Status (CB26)**

N - Course is not a support course

**Field trips**

Will not be required

**Grading method**

Letter Graded

**Does this course require an instructional materials fee?**

No

**Repeatable for Credit**

No

**Is this course part of a family?**

No

**Units and Hours**

**Carnegie Unit Override**

No

**In-Class**

**Lecture**

**Minimum Contact/In-Class Lecture Hours**

70

**Maximum Contact/In-Class Lecture Hours**

70

**Activity**

**Laboratory**

**Minimum Contact/In-Class Laboratory Hours**

52.5

**Maximum Contact/In-Class Laboratory Hours**

52.5

**Total in-Class**

**Total in-Class**

**Total Minimum Contact/In-Class Hours**

122.5

**Total Maximum Contact/In-Class Hours**

122.5

**Outside-of-Class****Internship/Cooperative Work Experience**

Paid

Unpaid

**Total Outside-of-Class****Total Outside-of-Class****Minimum Outside-of-Class Hours**

140

**Maximum Outside-of-Class Hours**

140

**Total Student Learning****Total Student Learning****Total Minimum Student Learning Hours**

262.5

**Total Maximum Student Learning Hours**

262.5

**Minimum Units (CB07)**

5

**Maximum Units (CB06)**

5

**Prerequisites**

CHEM R110 or CHEM R120

**Entrance Skills****Entrance Skills**

Ability to interpret the fundamental features of chemistry and perform the basic operations in a chemistry laboratory.

**Prerequisite Course Objectives**

CHEM R110-Analyze the fundamental features of chemistry including measurement, mathematical conversion of measured physical properties such as mass, volume, density, pressure, temperature, solutions, concentrations, and dilutions.

CHEM R110-Perform conversions using the technique of dimensional analysis and memorized metric conversion factors.

CHEM R110-Give the names and symbols of the common elements.

CHEM R110-Name or give the formulas of simple inorganic compounds.

CHEM R110-Identify and give general physical properties of the three states of matter. Describe phase-change between the three states.

CHEM R110-Differentiate clearly between chemical and physical changes, and among elements, compounds and mixtures.

CHEM R110-Write and evaluate chemical reactions and balance chemical equations.

CHEM R110-Perform stoichiometric calculations using the mole concept to determine weight percent composition, empirical formula, molecular formula, combining weight, theoretical yield, and limiting reactants.

CHEM R110-Describe atomic structure in terms of protons, neutrons, and electrons using the Bohr model.

CHEM R110-Relate electron configuration to the periodic table, and use the table to predict or explain variations in size, ionization energy, electronegativity, and metallic or non-metallic character.

CHEM R110-Describe covalent and ionic bonding in simple terms. Predict molecular shapes and polarities by VSEPR (Valence Shell Electron Pair Repulsion) Theory.

CHEM R110-Describe and explain the properties of gases in terms of KMT (Kinetic Molecular Theory). Calculate gas properties from the gas laws.

CHEM R110-Describe the properties of water and other liquids.

CHEM R110-Categorize the properties of solutions and describe the solution process on a molecular level.

CHEM R110-Give common concentration units and use them to perform calculations involving solutions.

CHEM R110-Describe properties of acids and bases, calculate pH, and compare and contrast the behavior associated with acids and bases.

**Entrance Skills**

Ability to interpret the fundamental features of chemistry and perform the basic operations in a chemistry laboratory.

**Prerequisite Course Objectives**

CHEM R120-Write the names and symbols of common elements. Name or give the formulas of simple inorganic compounds.

CHEM R120-Write and balance chemical equations including net-ionic equations.

CHEM R120-Perform stoichiometric calculations based on chemical formulas and balanced chemical equations.

CHEM R120-Describe the structure of the atom according to Rutherford's Experiment and Bohr's Theory. Give the modern wave mechanical view of the atom in terms of electronic orbitals.

CHEM R120-Relate periodic properties to electronic configurations of the elements.

CHEM R120-Give the four quantum numbers of an electron in a particular atomic orbital, and their role in describing the location and energy of the electron.

CHEM R120-Describe covalent and ionic bonding in terms of Lewis Dot Theory, Valence Bond Hybridization, and VSEPR (Valence Shell Electron Pair Repulsion). Relate chemical and physical properties to bonding and structure.

CHEM R120-Identify acids, bases, and salts. Describe solutions of strong, weak, and non-electrolytes. Predict and balance ionic reactions involving precipitation, displacement, and neutralization.

CHEM R120-Perform thermodynamics calculations involving calorimetry, Hess's Law, and heat of formation.

CHEM R120-Describe gases, liquids, and solids and perform calculations involving these three phases. Relate properties of each to Kinetic Molecular Theory and intermolecular forces.

CHEM R120-Discuss solutions and factors governing solubility. Perform calculations involving concentration units, especially dilution and neutralization.

CHEM R120-Use the concept of equilibrium and equilibrium constant to describe and perform calculations on equilibrium systems, especially in the gas phase. Apply Le Chatelier's Principle to predict response of equilibrium system to perturbations in concentration, temperature, and pressure.

**Requisite Justification****Requisite Type**

Prerequisite

**Requisite**

CHEM R110

**Requisite Description**

Course in a sequence

**Level of Scrutiny/Justification**

Content review

**Requisite Type**

Prerequisite

**Requisite**

CHEMR120

**Requisite Description**

Course in a sequence

**Level of Scrutiny/Justification**

Content review

**Student Learning Outcomes (CSLOs)**

**Upon satisfactory completion of the course, students will be able to:**

- |   |   |
|---|---|
| 1 | Give IUPAC names for organic compounds: nomenclature worksheets related to alkanes, alkenes, alkynes, aromatic hydrocarbons, alcohols, ethers, aldehydes, ketones, carboxylic acids, and their derivatives, amines, and amides. |
| 2 | Describe the structural features of carbohydrates.  |

**Course Objectives**

Upon satisfactory completion of the course, students will be able to:

- 1 Define the types of radioactive decay particles and describe their effects on the human body.
- 2 Describe properties, bonding and structure of various classes of organic compounds.
- 3 Describe the nature of hydrocarbons and organic functional groups in terms of bonding, structure, properties, reactions and natural occurrence.
- 4 Draw structures and give IUPAC (International Union of Pure and Applied Chemistry) names for organic compounds.
- 5 Identify carbon atoms as primary, secondary, or tertiary, and to compare the chemistry of functional derivatives.
- 6 State and apply Markovnikov's Rule to predict the product(s) of the addition of alkenes.
- 7 Describe the nature of hydrogen bond.
- 8 Describe the process of polymerization.
- 9 Explain the concepts of optical activity and optical isomerism and its reactions.
- 10 State whether an organic structure is polar or nonpolar, and use this determination to compare physical properties of various compounds.
- 11 Describe the structural features of carbohydrates.
- 12 Recognize glycosidic linkage.
- 13 State the monosaccharide composition of the disaccharides, such as sucrose, lactose, and maltose.
- 14 Name, describe and write the structural formulas for the organic products formed in the important chemical reactions of the four major classes of biological compounds.
- 15 Describe the structural features of amino acids and proteins.
- 16 Name the components of an enzyme.
- 17 Explain the role of enzyme in bio-transformation.
- 18 Compare and contrast the processes of DNA replication and transcription, RNA translation, and common types of mutations.
- 19 Demonstrate knowledge of major biochemical components in metabolism.

**Course Content****Lecture/Course Content**

1. Radioactivity and nuclear chemistry:
  - a. Atomic structure and isotopes
  - b. Simple nuclear decay
2. Hybridization:
  - a. Atomic orbital of carbon
  - b. VSEPR (Valence Shell Electron Pair Repulsion) model of a molecule
  - c. Hybridization of carbon
3. IUPAC (International Union of Pure and Applied Chemistry) nomenclature and the reaction of hydrocarbons:
  - a. IUPAC names of alkanes, alkenes, alkynes, and aromatic hydrocarbons
  - b. Substitutions of alkanes and aromatic hydrocarbons
  - c. Additions of alkenes and alkynes with the application of Markovnikov's Rule
4. Classification and reactions of organic compounds according to functional groups
  - a. IUPAC names of oxygen-containing organic compounds, including alcohol, phenol, ether, thiol, aldehyde, ketone, and carboxylic acid and its derivatives
  - b. IUPAC names of nitrogen contained organic compounds, including amines and amides
  - c. Structural recognition of organic compounds according to their functional groups
  - d. Reactions of organic compounds: including oxidation-reduction of alcohols and aldehydes, dehydration of alcohols, hydrolysis of esters and amides, preparations of an amide
5. Carbohydrates
  - a. Structural features of glucose, fructose, galactose, lactose, maltose, and sucrose
  - b. Recognition of glycosidic linkage in disaccharides, and polysaccharides.
6. Lipids
  - a. Classification of lipids
  - b. Function of lipids
7. Polypeptide formation

- a. Name and structure of amino acids
- b. Formation of polypeptide
8. Structures and reactions of proteins and enzymes
  - a. Four level structures of proteins
  - b. Names of components of an enzyme
  - c. Functions and reactions of proteins and enzymes in the human body
9. Structural and genetic aspects of DNA and RNA
  - a. Structures of nucleic acids
  - b. Structures of DNA and RNA
  - c. Genetic functions of DNA and RNA
10. Metabolism
  - a. Glycolysis
  - b. Glycogen metabolism
  - c. The oxidation of fatty acids
  - d. Amino acid catabolism

### Laboratory or Activity Content

- Safety Lecture and Safety Exam
- Physical properties of chemicals: melting point, boiling point, and sublimation
- Structure in organic compounds: Use of molecular models and draw the structural formulas of organic compounds
- Identification and characterization of the properties of
  - Hydrocarbons: Saturated and Unsaturated
  - Alcohols and Phenols
  - Ethers
  - Aldehydes
  - Ketones
  - Carboxylic acids and Esters
  - Amines and Amides
  - Carbohydrates and Reducing Sugars
  - Proteins
- Hydrolysis of
  - Esters: Acidic and Basic condition
  - Amides: Acidic and Basic condition
  - Carbohydrates: Acidic, Basic and Enzyme Solution
- Synthesis and analysis of
  - Esters
  - Aspirin
  - Soap
- Isolation of
  - Casein from milk
  - Cholesterol and Lecithin from egg yolk

### Methods of Evaluation

**Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):**

Problem solving exercises  
 Skills demonstrations  
 Written expression

**Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):**

Computational homework  
 Essays  
 Group projects  
 Individual projects  
 Journals  
 Laboratory activities  
 Laboratory reports  
 Mathematical proofs  
 Objective exams

Oral presentations  
 Projects  
 Problem-Solving Assignments  
 Problem-solving exams  
 Quizzes  
 Reports/papers  
 Research papers  
 Simulations

## Instructional Methodology

### Specify the methods of instruction that may be employed in this course

Audio-visual presentations  
 Computer-aided presentations  
 Collaborative group work  
 Class activities  
 Class discussions  
 Distance Education  
 Demonstrations  
 Group discussions  
 Instructor-guided interpretation and analysis  
 Instructor-guided use of technology  
 Laboratory activities  
 Lecture  
 Small group activities

### Describe specific examples of the methods the instructor will use:

- The instructor will give the lecture and use the whiteboard to show how a correct molecular structure should be drawn, including the location of the chemical bonds on the proper atoms.
- The instructor will illustrate the structures, reactions, and functions of proteins and enzymes in the human body.
- The instructor will lead the discussion, such as "Which dental filling is better, Amalgam or Composites?" to differentiate between two common dental fillings, Amalgam or Composites, identify the composition of each dental filling, and determine the possible bonding between teeth and each filling. Also, describe the damage that could be caused by mercury to a person.
- The instructor may provide the links to the videos of the topic lecture or demonstration of experiments to students for classifying the organic functional group and its corresponding family.

## Representative Course Assignments

### Writing Assignments

- Students will be required to complete weekly homework and assignments from the textbook, such as describe the connection between intramolecular hydrogen bonds and its boiling point of an organic compound.
- Students may be required to write an essay with the topics related to their careers. The topics of the essay reflect the development of new drugs and the application of new technology in the medical fields.
- Students will be required to write and present a term paper in the last lab section. The topic of the term paper reflects the subject discussed in the class, such as the benefits from taking Aspirin, organic synthesis in the development of the new drug, structure difference in the starch and cellulose with human digestion, or genetic diseases.
- Students will be required to write lab reports during lab time. The lab reports will be turned in at the end of each lab session.

### Critical Thinking Assignments

- Participate in the group discussion of "How does the way that you generate some of your additional body heat when you are cold differ from the way than an infant does so?" Students will be guided to use the definition of kinetic energy and potential energy to illustrate the direct proportion between temperature and kinetic energy when an adult generates heat. As for an infant, he/she will use brown fats, potential energy, in the body to generate heat. Students will post their interpretations on Canvas, then respond to their classmates.
- Write an essay to explain the difference in structures between ethanol and methanol and compare the products formed in the human body to illustrate the reasons why consuming 10 mL of methanol could kill a person, but ethanol would not.

### Reading Assignments

1. Textbook and lab manual
2. Journals related with chemistry, diet, health care; such as Journal of Chemical and Engineering News, published by American Chemical Society; Popular Science

3. Internet; such as [www.acs.org](http://www.acs.org) (<http://www.acs.org>), <http://ocw.mit.edu/OcwWeb/Chemistry/>, [www.anytimetutor.com](http://www.anytimetutor.com) (<http://www.anytimetutor.com>), [www.chemweb.com](http://www.chemweb.com) (<http://www.chemweb.com>)

### Skills Demonstrations

Students will demonstrate how to safely perform the required chemistry experiments in an in-person lab, such as:

- safely use Bunsen burner in the lab setting;
- properly operate a melting point apparatus to measure the melting points of different organic compounds;
- properly set-up boiling point glassware to measure the boiling points of organic compounds;
- properly transfer chemicals from a larger container to a test tube;
- safely transfer organic compounds under the fume hood;
- safely heat test tubes in a water bath;
- safely perform oxidation of different alcohols and aldehydes under fume hoods;
- use Benedict's reagent to identify reducing sugars;
- perform synthesis reactions to make Aspirin, soap, and esters;
- properly use a vacuum filtration apparatus to collect the products;
- safely perform Lieberman-Burchard test to identify cholesterols;
- properly use Biuret, Ninhydrin, and Xanthoprotein tests to analyze proteins.

### Other assignments (if applicable)

1. Encourage students to form a study group working together to solve the problems related to oxidation-reduction of alcohols and aldehyde, or syntheses of esters, hemiacetals, and acetals, or naming and structural drawing of organic molecules.
2. Help students individually in the instructor's office or through ConferZoom to show the details of reaction patterns.
3. Guide students regarding critical thinking about chemical properties related to the functions of biomolecules in the human body.

## Outside Assignments

### Representative Outside Assignments

- Students will be required to complete weekly homework and reading assignments from the textbook.
- Students may be required to search the internet to write an essay/discussion with the topics related to their careers. The topics of the essay/discussion reflect the discovery in the new virus, new vaccines, new drugs, and the application of new technology in the dental fields.

## Articulation

### C-ID Descriptor Number

CHEM 102

### Status

Approved

### Comparable Courses within the VCCCD

CHEM V21 - Introduction to Organic and Biochemistry



**District General Education****A. Natural Sciences****B. Social and Behavioral Sciences****C. Humanities****D. Language and Rationality****E. Health and Physical Education/Kinesiology****F. Ethnic Studies/Gender Studies****CSU GE-Breadth****Area A: English Language Communication and Critical Thinking****Area B: Scientific Inquiry and Quantitative Reasoning****Area C: Arts and Humanities****Area D: Social Sciences****Area E: Lifelong Learning and Self-Development****Area F: Ethnic Studies****CSU Graduation Requirement in U.S. History, Constitution and American Ideals:****IGETC****Area 1: English Communication****Area 2A: Mathematical Concepts & Quantitative Reasoning****Area 3: Arts and Humanities****Area 4: Social and Behavioral Sciences****Area 5: Physical and Biological Sciences****Area 6: Languages Other than English (LOTE)****Textbooks and Lab Manuals****Resource Type**

Textbook

**Description**The latest edition of Spencer L. Seager/Michael r. Slabaugh. *Organic and Biochemistry*. Brooks/Cole. Belmont, CA. USA**Resource Type**

Textbook

**Description**The latest edition of Frederick A. Bettelheim/Joseph M. Landesberg. *Signature Labs Series-Lab Manual for CHEMR112-Elementary Organic and Biochemistry*. Cengage Learning. Boston, MA. USA**Resource Type**

Other Instructional Materials

**Description**

Safety goggles.

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**Resource Type**

Other Instructional Materials

**Description**

Scientific calculator.

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**Resource Type**

Other Instructional Materials

**Description**

Molecular models .

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**Resource Type**

Other Instructional Materials

**Description**

Colored pens or pencils.

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## Distance Education Addendum

### Definitions

#### Distance Education Modalities

Hybrid (51%–99% online)

Hybrid (1%–50% online)

100% online

### Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities.

Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

## Regular Effective/Substantive Contact

### Hybrid (1%–50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Asynchronous essay/discussion through Canvas related to the course contents. The instructor will use asynchronous discussion boards encourages all students to participate in various types of interaction and critical thinking. Other discussion boards may be used for Q&A and general class discussions by students and instructors to facilitate student success in the course. Except for the midterm and final exam, other course assessments will be conducted through at the asynchronous time, such as upload homework, take a quiz, or conduct simulation experiments.
Face to Face (by student request; cannot be required)	The direct face-to-face contact time with the instructor will be during weekly class meetings in-person on campus, and the open office hours and times requested by a student in the ConferZoom. This time will provide students to discuss and ask questions about the material covered in the course or other concerns in the class, such as individual progress. The majority of the experiments will be conducted in a chemistry lab on campus, as well as the midterm and final exams.
E-mail	Email/Canvas LMS communication tools will be used frequently to converse with students, such as giving the feedback of uploaded homework and essay, clarifying course contents, reminding the upcoming class events, and regarding the issues related later homework, grades, absences, etc.
Other DE (e.g., recorded lectures)	The instructor may use a recorded lecture, video, cumulated notes, 3C media, and other external links to integrate with the course contents. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session.
Telephone	Students may request telephone calls for immediate assistant such as registration and grades, etc.
Video Conferencing	Schedule video conferences through ConferZoom to answer the questions related to the course contents and homework, also lead the discussion. The instructor will encourage students to form a study group using other media to facilitate student-to-student interactions.

### Hybrid (51%–99% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Regular use of asynchronous discussion boards encourages various types of interaction and critical thinking skills among all course participants. Questions and topics posed will allow students to discuss, compare and contrast, identify, and analyze elements of the course outcomes. Students will be required to respond to one another with substantive comments with the intent of creating a dialog. Other discussion boards may be used for Q&A and general class discussion by students and instructor to facilitate student success and strengthen student learning outcomes.
E-mail	E-mail, class announcements and various learning management system tools such as "Message Students Who" and "Assignment Comments", will be used to regularly communicate with all students on matters such as clarification of class content, reminders of upcoming assignments and/or course responsibilities, to provide prompt feedback to students on coursework to facilitate student learning outcomes, or to increase the role of an individual educator in the academic lives of a student. Students will be given multiple ways to email instructor through both the learning management system inbox and faculty provided email accounts.

Face to Face (by student request; cannot be required)	The instructor will hold weekly, scheduled office hours either in person or via-web conferencing, for students to be able to meet and discuss course materials or individual progress. Students can request additional in-person or web conferencing meetings with faculty member as needed. Faculty may encourage online students to form "study groups" in person or online.
E-mail	Faculty will use a variety of ADA compliant tools and media integrated within the learning management system to help students reach SLO competency. Tools may include: <ul style="list-style-type: none"> <li>• Recorded Lectures, Narrated Slides, Screencasts</li> <li>• Instructor created content</li> <li>• OC Online Library Resources</li> <li>• Canvas Peer Review Tool</li> <li>• Canvas Student Groups (Assignments, Discussions)</li> <li>• 3rd Party (Publisher) Tools (MyOpenMath)</li> <li>• Websites and Blogs</li> <li>• Multimedia (YouTube, Films on Demand, 3CMedia, Khan Academy, etc.)</li> </ul>
Other DE (e.g., recorded lectures)	Instructor will provide a set time each week where they will be available for synchronous chat and be available in the discussion board and can answer questions in live time.
Video Conferencing	Video tools such as ConferZoom can be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Recordings of all live sessions will be made available within the LMS. Video Conferences will be used to facilitate SLOs and student-to-student group meetings will also be encouraged.
Telephone	Students can request for instructor to call or vice versa in order to answer one-on-one questions about course material or student progress.

**100% online Modality:****Method of Instruction****Document typical activities or assignments for each method of instruction**

Asynchronous Dialog (e.g., discussion board)	Asynchronous essay/discussion through Canvas related to the course contents. The instructor will use asynchronous discussion boards encourages all students to participate in various types of interaction and critical thinking. Other discussion boards may be used for Q&A and general class discussions by students and instructors to facilitate student success in the course. Except for the midterm and final exam, other course assessments will be conducted through at the asynchronous time, such as upload homework, take a quiz, or conduct simulation experiments.
E-mail	Email/Canvas LMS communication tools will be used frequently to converse with students, such as giving the feedback of uploaded homework and essay, clarifying course contents, reminding the upcoming class events, and regarding the issues related to later homework, grades, absences, etc.
Face to Face (by student request; cannot be required)	Face to face will be arranged through ConferZoom. The instructor will hold scheduled office hours for students to be able to meet and discuss course materials or individual progress. Students can request additional zoom meetings with the faculty member as needed. Faculty may encourage students to form "study groups" online.
Other DE (e.g., recorded lectures)	The instructor may use a recorded lecture, video, cumulated notes, 3C media, and other external links, such as YouTube, Films on Demand, Khan Academy, etc. to integrate with the course contents. The contents may provide the instructions of glassware set-up, data analysis, or experiment results from labs. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session.
Synchronous Dialog (e.g., online chat)	Synchronous through ConferZoom for the topics related to the course contents. The set-time will be published in the course schedule. The instructor may also provide a set time as office hours each week where she/he will be available for answering questions in live time. The midterms and final exams will be conducted during the synchronous schedule time.

Telephone

Students may request the instructor to call or vice versa in order to answer one-on-one questions about course material or student progress or registration issues.

Video Conferencing

ConferZoom help sessions will be scheduled before or after synchronous time. The instructor may also encourage students to form a study group using video conferences to facilitate student-to-student interactions. Students may request extra asynchronous sessions for a group discussion to work on the class projects or experiment simulations.

## Examinations

### Hybrid (1%–50% online) Modality

Online

On campus

### Hybrid (51%–99% online) Modality

Online

On campus

## Primary Minimum Qualification

CHEMISTRY

## Review and Approval Dates

### Department Chair

09/04/2020

### Dean

09/04/2020

### Technical Review

09/09/2020

### Curriculum Committee

09/09/2020

### DTRW-I

MM/DD/YYYY

### Curriculum Committee

11/25/2020

### Board

MM/DD/YYYY

### CCCCO

MM/DD/YYYY

### Control Number

CCC000198572

### DOE/accreditation approval date

MM/DD/YYYY