CHEM-241: ORGANIC CHEMISTRY 2

Effective Term
Fall 2026

CC Approval
12/05/2025

AS Approval
12/11/2025

BOT Approval
12/18/2025

COCI Approval
03/05/2026

SECTION A - Course Data Elements

CB04 Credit Status
Credit - Degree Applicable

Discipline

Minimum Qualifications	And/Or
Chemistry (Master's Degree)	

Subject Code
CHEM - Chemistry
Course Number
241

Department
Chemistry

Division
Science and Engineering (SE)

Full Course Title
Organic Chemistry 2

Short Title
Organic Chemistry 2

CB03 TOP Code
1905.00 - Chemistry, General

CIP Code
40.0501

CB08 Basic Skills Status
NBS - Not Basic Skills

CB09 SAM Code
E - Non-Occupational

Rationale
Update DEI.

SECTION B - Course Description

Catalog Course Description
This course is a continuation of Organic Chemistry 1. Introduction to NMR, IR, and Mass Spectroscopy. Chemical reactions and syntheses of aromatic, carbonyl, and amine compounds. Special topics in carbohydrate, amino acid, and lipid chemistry. Lab work includes simple and multi-step syntheses and spectral identification.

SECTION C - Conditions on Enrollment

Open Entry/Open Exit
No

Repeatability
Not Repeatable

Grading Options
Letter Grade or Pass/No Pass

Allow Audit
Yes

Requisites

Prerequisite(s)
Completion of CHEM-240 with a minimum grade of C.

Requisite Justification

Requisite Description
Course in a Sequence

Subject
Chem

Course #
240

Level of Scrutiny
Required by 4-Year Institution

Explanation
Before entering the second semester of Organic Chemistry, all CSU and UC (Including Sac State, UC Davis, and UC Berkeley) require completion of the first semester of Organic Chemistry. At NVC, the first semester of Organic Chemistry is Chem 240.

SECTION D - Course Standards

Is this course variable unit?
No

Units
5.00000

Lecture Hours
54

Lab Hours
108

Outside of Class Hours
108

Total Contact Hours
162

Total Student Hours
270

Distance Education Approval

Is this course offered through Distance Education?
Yes

Online Delivery Methods

DE Modalities	Permanent or Emergency Only?
Hybrid	Permanent

SECTION E - Course Content

Student Learning Outcomes

	Upon satisfactory completion of the course, students will be able to:
1.	Communicate chemical and physical processes at the molecular level and how they relate to the macroscopic environment.
2.	Solve synthetic reaction pathways and mechanisms while demonstrating the reasoning clearly and completely.
3.	Implement laboratory techniques correctly using appropriate safety procedures and express them clearly in written laboratory reports.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1.	Solve complex reaction mechanisms.
2.	Synthesize compounds starting with simple ingredients.
3.	Determine the structure of organic compounds from spectrographic data.
4.	Name organic compounds based on their structure.

Course Content
Lecture Content

1. Spectroscopy
   a. Nuclear Magnetic Resonance
   b. Infrared Spectroscopy
   c. Mass Spectrometry
2. Aromatics I: Aromaticity
   a. Reactions of benzene, Kekules structure, stability, and modern theories of the structure for benzene.
   b. Huckel's Rule and other aromatics.
   c. Nomenclature of benzene derivatives.
   d. Heterocyclic aromatics and aromatics in biochemistry.
3. Aromatics II: Reactions with Electrophiles
   a. Electrophilic aromatic substitutions and their mechanisms.
   b. Halogenation, nitration, sulfonation and alkylation of benzene.
   c. Effects of substituents-reactivity and directing influences.
   d. Alkyl and alkenyl benzenes and their reactions.
   e. Carbenes.
4. Aldehydes and Ketones
   a. Structure, nomenclature and physical properties.
   b. Reactions of carbonyls - acetals, hemi-acetals, ammonia derivatives, and Schiff base reactons.
   c. Keto-enol tautomerism, and the Cannizzaro Reaction.
5. Carboxylic Acids and their Derivatives
   a. Nomenclature and physical properties.
   b. Preparation and reactions at acyl carbon.

   c. Synthesis and reactions of acyl halides, acid anhydrides, esters and amides.
   d. Hell-Volhard-Zelinski and decarboxylation reactions.
   e. Claisen, Michael, and Aldol reactions and synthetic pathways.
6. Amines
   a. Nomenclature, physical properties and their basicities.
   b. Some biologically important amines.
   c. Preparation and reactions of amines with nitrous acid, diazonium salts.
   d. The sulfa drugs.
   e. Analysis of amines.
7. Carbohydrates
   a. Monosaccharides, mutarotation and glycoside formation.
   b. Oxidation and reduction, osazone formation.
   c. Synthesis and degradation of monosaccharides.
   d. The D-family of aldoses.
   e. Methylation of monosaccharides.
   f. Di- and poly- saccharides.
   g. Nitrogen containing sugars.
8. Lipids
   a. Fatty acids and Triacylglycerols.
   b. Steroids and prostaglandins.
   c. Phospholipids, waxes and terpenes.
9. Amino Acids and Proteins
   a. Important amino acids.
   b. Laboratory synthesis and analysis of amino acids.
   c. Amino acid sequence of proteins and polypeptides.
   d. Primary structure of polypeptides and their synthesis.
   e. Secondary and tertiary structure of proteins.

Lab Content

1. Methods of separation and purification
   a. Simple and Fractional Distillation
   b. Liquid-liquid extraction
   c. Recrystallization
   d. GC/TLC/Column Chromatography
2. Lab Techniques
   a. Reflux columns
   b. Gas Traps
   c. Vacuum distillation
   d. Air drying tubes
3. Spectroscopic Identification
   a. FT-IR
   b. NMR
   c. GC-MS
4. Multistep syntheses
   a. Synthesis of butyl methyl ether from butanol

Synthesis of Tylenol

Methods of Instruction

Methods of Instruction

Types	Examples of learning activities
Lab	Lab techniques are taught during a 4 hour lab period once per week.
Lecture	Students attend three hours of lecture per week.
Discussion	Two 1-hour short discussions on the weekly lab, lecture material, or Quiz
Experiments	Students are required to attend a four hour lab period where they do experiments in groups.

Observation and Demonstration	In-class demonstrations and online videos are shown to solidify and expand the lecture

Online Adaptation

Types	Examples of learning activities
Lecture	Lectures will be similar to those in person but broadcast synchronously or asynchronously through zoom.

Instructor-Initiated Online Contact Types

E-mail Communication
Video or Teleconferencing

Student-Initiated Online Contact Types

Discussions
Group Work

Course design is accessible

Yes

Methods of Evaluation

Methods of Evaluation

Types	Examples of classroom assessments
Exams/Tests	Examinations (normally, four, including the final exam). Exams will be fill in, multiple choice, true/false, and short answer, and will be graded on a point scale. A sample question may be, "Given the NMR, IR, and Mass Spec provided, please draw the structure of the compound." or "What is the primary intermolecular bonding force in each of the following compounds?" or perhaps, "Explain how a triplet is formed in NMR."
Lab Activities	Regular attendance in the laboratory. All labs will be checked off by the instructor prior to the student leaving the lab.

Assignments

Reading Assignments

Daily reading of text; weekly reading of lab manual (ex: Read Chapter 2,"Bonding and Molecular Properties," Sections 2.1 through 2.4 in your text and read the first lab, "Simple and Fractional Distillations."

Writing Assignments

The students will be required to read assigned chapters in the text and lab manual. The students turn in weekly lab write-ups which are formatted according to Title, Procedure, Data, Calculations, Conclusions, and Sources of Error. End of chapter problems are assigned. Three exams and a final are given, and labs are graded. Each of these include essay and short answer solutions. A 5–10-page paper is due at the end of the semester.

SECTION F - Textbooks and Instructional Materials

Material Type

Textbook

Author

K. Peter C. Vollhardt, Neil E. Schore

Title

Organic Chemistry: Structure and Function

Edition/Version

8th Edition

Publisher

W. H. Freeman

Year

2018

Rationale
Book update from the previous edition

ISBN #
1319079458

Material Type
Manual

Author
S.E. Fawl

Title
Organic Chemistry 2 - Laboratory Manual

Publisher
Fountainhead Press

Year
2018

SECTION G - Diversity, Equity and Inclusivity

How does your course and/or course outline of record reflect strategies for accommodating and engaging diverse student populations, advancing equitable outcomes, and fostering inclusion for all students?
This course supports diverse student populations through the use of multiple representations of concepts, varied applications, and technology. Strategies may also include collaborative learning, transparent assessment practices, low-cost resources, alternative formative assessment, structured opportunities for direct communication with the instructor, and opportunities for students to connect course material to their own experiences, fostering equitable outcomes and an inclusive classroom environment.

Course Codes (Admin Only)

CB00 State ID
CCC000207712

CB10 Cooperative Work Experience Status
N - Is Not Part of a Cooperative Work Experience Education Program

CB11 Course Classification Status
Y - Credit Course

CB13 Special Class Status
N - The Course is Not an Approved Special Class

CB23 Funding Agency Category
Y - Not Applicable (Funding Not Used)

CB24 Program Course Status
Program Applicable

Allow Pass/No Pass
Yes

Only Pass/No Pass
No