

Washtenaw Community College Comprehensive Report

CEM 211 Organic Chemistry I Effective Term: Winter 2025

Course Cover

College: Math, Science and Engineering Tech

Division: Math, Science and Engineering Tech

Department: Chemistry

Discipline: Chemistry

Course Number: 211

Org Number: 12320

Full Course Title: Organic Chemistry I

Transcript Title: Organic Chemistry I

Is Consultation with other department(s) required: No

Publish in the Following: College Catalog , Time Schedule , Web Page

Reason for Submission: Course Change

Change Information:

Consultation with all departments affected by this course is required.

Course description

Objectives/Evaluation

Rationale: There are some topics that need to be updated in alignment with four-year institutions.

Proposed Start Semester: Winter 2024

Course Description: In this course, students will learn the nomenclature of organic compounds, stereochemistry, preparation and reactions of aliphatic and aromatic compounds. In the laboratory, students will practice the preparation and handling of organic compounds, including purifying and characterizing organic compounds. This course is the first in a two-semester sequence in organic chemistry.

Course Credit Hours

Variable hours: No

Credits: 4

Lecture Hours: Instructor: 45 **Student:** 45

Lab: Instructor: 45 **Student:** 45

Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 90 **Student:** 90

Repeatable for Credit: NO

Grading Methods: Letter Grades

Audit

Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

Level 3

Requisites

Prerequisite

CEM 122 minimum grade "C"

General Education

MACRAO

MACRAO Science & Math

MACRAO Lab Science Course

General Education Area 4 - Natural Science

Assoc in Applied Sci - Area 4

Assoc in Science - Area 4

Assoc in Arts - Area 4

Michigan Transfer Agreement - MTA

MTA Lab Science

Request Course Transfer

Proposed For:

Eastern Michigan University

Michigan State University

Oakland University

University of Detroit - Mercy

University of Michigan

Wayne State University

Western Michigan University

Student Learning Outcomes

1. Classify and name organic compounds based on their functional groups. Apply nomenclature rules to recognize correct chemical names, formulas and structures.

Assessment 1

Assessment Tool: Outcome-related department exam questions

Assessment Date: Fall 2024

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of students will score 75% or higher.

Who will score and analyze the data: Departmental faculty

2. Recognize and use organic chemical reaction mechanisms and their energy diagrams to correctly predict reaction products.

Assessment 1

Assessment Tool: Outcome-related department exam questions

Assessment Date: Fall 2024

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of students will score 75% or higher

Who will score and analyze the data: Departmental faculty

3. Relate stereochemistry of reactants to reaction type in order to predict synthetic pathways as well as products.

Assessment 1

Assessment Tool: Outcome-related department exam questions

Assessment Date: Fall 2024

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of students will score 75% or higher

Who will score and analyze the data: Departmental faculty

4. Perform laboratory procedures related to stereochemistry, recrystallization, distillation, chromatography, synthesis, isomerization, and physical characterization. Collect data, perform calculations and draw conclusions based on the results.

Assessment 1

Assessment Tool: Outcome-related lab reports

Assessment Date: Fall 2024

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: Random sample of 30% of all students with a minimum of one full section.

How the assessment will be scored: Departmental rubric

Standard of success to be used for this assessment: 70% of students will score 6 out of 9 or higher

Who will score and analyze the data: Departmental faculty

Course Objectives

1. Structure and properties of organic compounds: Define organic chemistry, and distinguish between organic and inorganic compounds based on their structure and physical properties.
2. Structure and properties of organic compounds: Draw Lewis structures, and identify hybridization type based on the Lewis structure.
3. Structure and properties of organic compounds: Identify Lewis acids and bases and how they react.
4. Saturated Hydrocarbons: Identify organic compounds by functional group.
5. Saturated Hydrocarbons: Name organic compounds using IUPAC rules.
6. Saturated Hydrocarbons: Distinguish between structural isomers, stereoisomers and conformers.
7. Saturated Hydrocarbons: Draw energy profiles of bond rotation.
8. Organic Reactions: Identify types: polar, radical and pericyclic.
9. Organic Reactions: Write reaction mechanisms and energy diagrams to describe reactions.
10. Organic Reactions: Use curved arrow notation in reaction mechanisms.
11. Organic Reactions: Relate reactivity and reaction type to structure.
12. Alkenes and Alkynes: Calculate the degree of unsaturation of organic compounds.
13. Alkenes and Alkynes: Arrange alkenes in order of stability.
14. Alkenes and Alkynes: Name alkenes using E, Z rules.
15. Alkenes and Alkynes: Identify addition, elimination, substitution and rearrangement reaction types. Given parts of a reaction, complete the reaction.
16. Alkenes and Alkynes: Relate carbocation structure with stability and reaction pathway, according to the Hammond postulate.
17. Stereochemistry: Apply the concept of chirality.
18. Stereochemistry: Manipulate structures to solve for stereochemical configurations.
19. Stereochemistry: Apply knowledge of stereochemistry to organic reactions.
20. Alkyl Halides and alcohols: Relate structure to reactivity.
21. Alkyl Halides and alcohols: Study reactions of alkyl halides: a) substitution, b) elimination.
22. Alkyl Halides and alcohols: Apply knowledge of reaction mechanisms to different reaction types.
23. Alkyl Halides and alcohols: Draw conclusions as to overall structure and stereochemistry of reaction products.
24. Free radical reactions and Dienes: Explore free radical reactions (e.g., alkyl halide preparation and polymerization). Dienes: a) addition reactions and b) Diels-Alder cyclo-addition reactions.

25. Aromatic compounds: Identify aromatic compounds, based on Huckel's rule.
26. Aromatic Compounds: Draw the major product and reaction mechanism of electrophilic aromatic substitution reactions.
27. Aromatic Compounds: Predict the effects of substituents on reaction products and rates.
28. Aromatic Compounds: Show the major products of nucleophilic aromatic substitution and benzyne reaction types.
29. Laboratory: Observe safety procedures.
30. Laboratory: Keep a journal.
31. Laboratory: Manipulate laboratory equipment.
32. Laboratory: Interpret and follow written procedures.
33. Laboratory: Collect and measure data.
34. Laboratory: Interpret and summarize data.
35. Laboratory: Apply significant figures to measurements, calculations, and data analysis.
36. Laboratory: Draw conclusions based on experiment results.

New Resources for Course

Course Textbooks/Resources

Textbooks

Klein, D. *Organic Chemistry*, 2 ed. Wiley, 2015, ISBN: 978-1-118-452.

Manuals

Periodicals

Software

Equipment/Facilities

Level III classroom

Other: Laboratory

<u>Reviewer</u>	<u>Action</u>	<u>Date</u>
Faculty Preparer: <i>Nagash Clarke</i>	<i>Faculty Preparer</i>	<i>Mar 22, 2024</i>
Department Chair/Area Director: <i>Breege Concannon</i>	<i>Recommend Approval</i>	<i>Mar 25, 2024</i>
Dean: <i>Tracy Schwab</i>	<i>Recommend Approval</i>	<i>Mar 28, 2024</i>
Curriculum Committee Chair: <i>Randy Van Wagnen</i>	<i>Recommend Approval</i>	<i>Sep 24, 2024</i>
Assessment Committee Chair: <i>Jessica Hale</i>	<i>Recommend Approval</i>	<i>Sep 30, 2024</i>
Vice President for Instruction: <i>Brandon Tucker</i>	<i>Approve</i>	<i>Oct 11, 2024</i>

Washtenaw Community College Comprehensive Report

CEM 211 Organic Chemistry I Effective Term: Spring/Summer 2024

Course Cover

College: Math, Science and Engineering Tech

Division: Math, Science and Engineering Tech

Department: Chemistry

Discipline: Chemistry

Course Number: 211

Org Number: 12320

Full Course Title: Organic Chemistry I

Transcript Title: Organic Chemistry I

Is Consultation with other department(s) required: No

Publish in the Following: College Catalog , Time Schedule , Web Page

Reason for Submission: Course Change

Change Information:

Consultation with all departments affected by this course is required.

Objectives/Evaluation

Rationale: Expansion of reactions studied to align better with 4-year transfer schools to make transfer more seamless.

Proposed Start Semester: Winter 2024

Course Description: This course is the first in a two-semester sequence in organic chemistry. Students will learn the nomenclature of organic compounds, stereochemistry, preparation and reactions of aliphatic and aromatic compounds. In the laboratory, students will practice the preparation and handling of organic compounds, including purifying and characterizing organic compounds.

Course Credit Hours

Variable hours: No

Credits: 4

Lecture Hours: Instructor: 45 **Student:** 45

Lab: Instructor: 45 **Student:** 45

Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 90 **Student:** 90

Repeatable for Credit: NO

Grading Methods: Letter Grades

Audit

Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

Level 3

Requisites

Prerequisite

CEM 122 minimum grade "C"

General Education

MACRAO

MACRAO Science & Math

MACRAO Lab Science Course

General Education Area 4 - Natural Science

Assoc in Applied Sci - Area 4

Assoc in Science - Area 4

Assoc in Arts - Area 4

Michigan Transfer Agreement - MTA

MTA Lab Science

Request Course Transfer

Proposed For:

Eastern Michigan University

Michigan State University

Oakland University

University of Detroit - Mercy

University of Michigan

Wayne State University

Western Michigan University

Student Learning Outcomes

1. Classify and name organic compounds based on their functional groups. Apply nomenclature rules to recognize correct chemical names, formulas and structures.

Assessment 1

Assessment Tool: Outcome-related department exam questions

Assessment Date: Fall 2024

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of students will score 75% or higher

Who will score and analyze the data: Department faculty

2. Recognize and use organic chemical reaction mechanisms and their energy diagrams to correctly predict reaction products.

Assessment 1

Assessment Tool: Outcome-related department exam questions

Assessment Date: Fall 2024

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of students will score 75% or higher

Who will score and analyze the data: Department faculty

3. Relate stereochemistry of reactants to reaction type in order to predict synthetic pathways as well as products.

Assessment 1

Assessment Tool: Outcome-related department exam questions

Assessment Date: Fall 2024

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of students will score 75% or higher

Who will score and analyze the data: Department faculty

4. Perform laboratory procedures related to stereochemistry, recrystallization, distillation, chromatography, synthesis, isomerization, and physical characterization. Collect data, perform calculations and draw conclusions based on the results.

Assessment 1

Assessment Tool: Lab reports

Assessment Date: Fall 2024

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: Random sample of 30% of all students with a minimum of one full section.

How the assessment will be scored: Departmental rubric

Standard of success to be used for this assessment: 70% of students will score 6 out of 9 or higher

Who will score and analyze the data: Departmental faculty

Course Objectives

1. Structure and properties of organic compounds: Define organic chemistry, and distinguish between organic and inorganic compounds based on their structure and physical properties.
2. Structure and properties of organic compounds: Draw Lewis structures, and identify hybridization type based on Lewis structure.
3. Structure and properties of organic compounds: Identify Lewis acids and bases and how they react.
4. Saturated Hydrocarbons: Identify organic compounds by functional group.
5. Saturated Hydrocarbons: Name organic compounds using IUPAC rules.
6. Saturated Hydrocarbons: Distinguish between structural isomers, stereoisomers and conformers.
7. Saturated Hydrocarbons: Draw energy profiles of bond rotation.
8. Organic Reactions: Identify types - polar, radical and pericyclic.
9. Organic Reactions: Write reaction mechanisms and energy diagrams to describe reactions.
10. Organic Reactions: Use curved arrow notation in reaction mechanisms.
11. Organic Reactions: Relate reactivity and reaction type to structure.
12. Alkenes and Alkynes: Calculate degree of unsaturation of organic compounds.
13. Alkenes and Alkynes: Arrange alkenes in order of stability.
14. Alkenes and Alkynes: Name alkenes using E, Z rules.
15. Alkenes and Alkynes: Identify addition, elimination, substitution and rearrangement reaction types. Given parts of a reaction, complete the reaction.
16. Alkenes and Alkynes: Relate carbocation structure with stability and reaction pathway, according to the Hammond postulate.
17. Stereochemistry: Apply the concept of chirality.
18. Stereochemistry: Manipulate structures to solve for stereochemical configurations.
19. Stereochemistry: Apply knowledge of stereochemistry to organic reactions.
20. Alkyl Halides and alcohols: Relate structure to reactivity.
21. Alkyl Halides and alcohols: Study reactions of alkyl halides: a) substitution, b) elimination, c) organometallic coupling, d) preparation. Alcohols: preparation by a) carbonyl reduction, b) oxidation, c) organometallic coupling.
22. Alkyl Halides and alcohols: Apply knowledge of reaction mechanisms to different reaction types.
23. Alkyl Halides and alcohols: Draw conclusions as to overall structure and stereochemistry of reaction products.
24. Free radical reactions and Dienes. Explore free radical reactions (e.g., alkyl halide preparation and polymerization). Dienes: a) addition reactions and b) Diels-Alder cyclo-addition reactions
25. Aromatic compounds: Identify aromatic compounds, based on Huckel's rule.

26. Aromatic compounds: Draw all resonance forms of aromatic compounds. Complete reactions of aromatic compounds.
27. Laboratory: Observe safety procedures.
28. Laboratory: Keep a journal.
29. Laboratory: Manipulate laboratory equipment.
30. Laboratory: Interpret and follow written procedures.
31. Laboratory: Collect and measure data.
32. Laboratory: Interpret and summarize data.
33. Laboratory: Apply significant figures to measurements, calculations, and data analysis.
34. Laboratory: Draw conclusions based on experiment results.

New Resources for Course

Course Textbooks/Resources

Textbooks

Klein, D. *Organic Chemistry*, 2 ed. Wiley, 2015, ISBN: 978-1-118-452.

Manuals

Periodicals

Software

Equipment/Facilities

Level III classroom

Other: Laboratory

<u>Reviewer</u>	<u>Action</u>	<u>Date</u>
Faculty Preparer: <i>Nagash Clarke</i>	<i>Faculty Preparer</i>	<i>Jul 27, 2023</i>
Department Chair/Area Director: <i>Breege Concannon</i>	<i>Recommend Approval</i>	<i>Aug 17, 2023</i>
Dean: <i>Tracy Schwab</i>	<i>Recommend Approval</i>	<i>Aug 18, 2023</i>
Curriculum Committee Chair: <i>Randy Van Wagnen</i>	<i>Recommend Approval</i>	<i>Jan 24, 2024</i>
Assessment Committee Chair: <i>Jessica Hale</i>	<i>Recommend Approval</i>	<i>Jan 25, 2024</i>
Vice President for Instruction: <i>Brandon Tucker</i>	<i>Approve</i>	<i>Jan 27, 2024</i>

Washtenaw Community College Comprehensive Report

CEM 211 Organic Chemistry I Effective Term: Winter 2020

Course Cover

Division: Math, Science and Engineering Tech

Department: Physical Sciences

Discipline: Chemistry

Course Number: 211

Org Number: 12320

Full Course Title: Organic Chemistry I

Transcript Title: Organic Chemistry I

Is Consultation with other department(s) required: No

Publish in the Following: College Catalog , Time Schedule , Web Page

Reason for Submission: Three Year Review / Assessment Report

Change Information:

Consultation with all departments affected by this course is required.

Objectives/Evaluation

Other:

Rationale: Three year review of course.

Proposed Start Semester: Fall 2019

Course Description: This course is the first in a two-semester sequence in organic chemistry. Students will learn the nomenclature of organic compounds, stereochemistry, preparation and reactions of aliphatic and aromatic compounds. In the laboratory, students will practice the preparation and handling of organic compounds, including purifying and characterizing organic compounds.

Course Credit Hours

Variable hours: No

Credits: 4

Lecture Hours: Instructor: 45 **Student:** 45

Lab: Instructor: 45 **Student:** 45

Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 90 **Student:** 90

Repeatable for Credit: NO

Grading Methods: Letter Grades

Audit

Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

Level 3

Requisites

Prerequisite

CEM 122 minimum grade "C"

General Education

MACRAO

MACRAO Science & Math

MACRAO Lab Science Course

General Education Area 4 - Natural Science

Assoc in Applied Sci - Area 4

Assoc in Science - Area 4

Assoc in Arts - Area 4

Michigan Transfer Agreement - MTA

MTA Lab Science

Request Course Transfer

Proposed For:

Central Michigan University

Eastern Michigan University

Michigan State University

Oakland University

University of Detroit - Mercy

University of Michigan

Wayne State University

Western Michigan University

Student Learning Outcomes

1. Classify and name organic compounds based on their functional groups. Apply nomenclature rules to recognize correct chemical names, formulas and structures.

Assessment 1

Assessment Tool: Departmental exam

Assessment Date: Fall 2019

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of students will score 75% or higher

Who will score and analyze the data: Department faculty

2. Recognize and use organic chemical reaction mechanisms and their energy diagrams to correctly predict reaction products.

Assessment 1

Assessment Tool: Department exam

Assessment Date: Fall 2019

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of students will score 75% or higher

Who will score and analyze the data: Department faculty

3. Relate stereochemistry of reactants to reaction type in order to predict synthetic pathways as well as products.

Assessment 1

Assessment Tool: Department exam

Assessment Date: Fall 2019

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of students will score 75% or higher

Who will score and analyze the data: Department faculty

4. Perform laboratory procedures related to stereochemistry, recrystallization, distillation, chromatography, synthesis, isomerization, and physical characterization. Collect data, perform calculations and draw conclusions based on the results.

Assessment 1

Assessment Tool: Lab reports

Assessment Date: Fall 2019

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: Random sample of 30% of all students with a minimum of one full section.

How the assessment will be scored: Departmental rubric

Standard of success to be used for this assessment: 70% of students will score 6 out of 9 or higher

Who will score and analyze the data: Departmental faculty

Course Objectives

1. Structure and properties of organic compounds: Define organic chemistry, and distinguish between organic and inorganic compounds based on their structure and physical properties.
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5. Saturated Hydrocarbons: Name organic compounds using IUPAC rules.
6. Saturated Hydrocarbons: Distinguish between structural isomers, stereoisomers and conformers.
7. Saturated Hydrocarbons: Draw energy profiles of bond rotation.
8. Organic Reactions: Identify types - polar, radical and pericyclic.
9. Organic Reactions: Write reaction mechanisms and energy diagrams to describe reactions.
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11. Organic Reactions: Relate reactivity and reaction type to structure.
12. Alkenes and Alkynes: Calculate degree of unsaturation of organic compounds.
13. Alkenes and Alkynes: Arrange alkenes in order of stability.
14. Alkenes and Alkynes: Name alkenes using E, Z rules.
15. Alkenes and Alkynes: Identify addition, elimination, substitution and rearrangement reaction types. Given parts of a reaction, complete the reaction.
16. Alkenes and Alkynes: Relate carbocation structure with stability and reaction pathway, according to the Hammond postulate.
17. Stereochemistry: Apply the concept of chirality.
18. Stereochemistry: Manipulate structures to solve for stereochemical configurations.
19. Stereochemistry: Apply knowledge of stereochemistry to organic reactions.
20. Alkyl Halides: Relate structure to reactivity.
21. Alkyl Halides: Study reactions of alkyl halides: a) substitution, b) elimination, c) organometallic coupling.
22. Alkyl Halides: Apply knowledge of reaction mechanisms to different reaction types.
23. Alkyl Halides: Draw conclusions as to overall structure and stereochemistry of reaction products.
24. Aromatic compounds: Recognize the concept of aromaticity.
25. Aromatic compounds: Identify aromatic compounds, based on Huckel's rule.
26. Aromatic compounds: Draw all resonance forms of aromatic compounds. Complete reactions of aromatic compounds.
27. Laboratory: Observe safety procedures.

28. Laboratory: Keep a journal.
29. Laboratory: Manipulate laboratory equipment.
30. Laboratory: Interpret and follow written procedures.
31. Laboratory: Collect and measure data.
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33. Laboratory: Apply significant figures to measurements, calculations, and data analysis.
34. Laboratory: Draw conclusions based on experiment results.

New Resources for Course

Course Textbooks/Resources

Textbooks

Klein, D. *Organic Chemistry*, 2 ed. Wiley, 2015, ISBN: 978-1-118-452.

Manuals

Periodicals

Software

Equipment/Facilities

Level III classroom

Other: Laboratory

<u>Reviewer</u>	<u>Action</u>	<u>Date</u>
Faculty Preparer: <i>Breege Concannon</i>	<i>Faculty Preparer</i>	<i>May 22, 2019</i>
Department Chair/Area Director: <i>Suzanne Albach</i>	<i>Recommend Approval</i>	<i>Jun 03, 2019</i>
Dean: <i>Kimberly Jones</i>	<i>Request Conditional Approval</i>	<i>Jul 02, 2019</i>
Curriculum Committee Chair: <i>Lisa Veasey</i>	<i>Recommend Approval</i>	<i>Aug 14, 2019</i>
Assessment Committee Chair: <i>Shawn Deron</i>	<i>Recommend Approval</i>	<i>Sep 10, 2019</i>
Vice President for Instruction: <i>Kimberly Hurns</i>	<i>Approve</i>	<i>Sep 11, 2019</i>