# Organic Chemistry 1 for Majors – CHM 2212 Syllabus

version 1

CHM 2212, Class #11025, **Fall 2024**, Monday, Wednesday, Friday, 10:40 am – 11:30 am
221 Scott Family Hall (SFH), Professor Stephen A. Miller, miller@chem.ufl.edu, Office LEI 318A

**Course Description.** The first half of the CHM 2212/2213 sequence for **chemistry majors**. A study of structures, synthesis, and reactions of organic compounds, with emphasis on mechanism and spectroscopy.
**Prerequisites.** CHM 2046 and CHM 2046L, or the equivalent; chemistry majors (CY or CY BIO) only.

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| 1 | August 23 | **1.1–1.4** | Introduction, Electrons, Bonds, Lewis Structures, Formal Charge |
| 2 | August 26 | **1.5–1.9** | Covalent Bonds, Bond-Line Structures, Atomic Orbitals, VB Theory, MO Theory |
| 3 | August 28 | **1.10–1.14** | Hybridization, VSEPR, Polarity, Intermolecular Forces, Solubility |
| 4 | August 30 | **2.1–2.5** | Molecular Representations, Line-Bond, Functional Groups, Lone Pairs **•PS#1** |
| | September 2 | **Holiday** | Labor Day |
| 5 | September 4 | **2.6–2.10** | 3D Line-Bond Structures, Resonance, Curved Arrows, Resonance Structures, |
| 6 | September 6 | **2.11–2.13** | Relative Importance of Resonance Structures, Resonance Hybrids, Delocalization |
| 7 | September 9 | **3.1–3.5** | Brønsted-Lowry Acids and Bases, Electron Flow, p$K_a$ Values **•PS#2** |
| 8 | September 11 | **3.6–3.10** | Equilibrium, Leveling, Solvation, Counterions, Lewis Acids and Bases |
| 9 | September 13 | **4.1–4.4** | Alkanes, Alkane Nomenclature, Constitutional Isomerism, Stability **•PS#3** |
| 10 | September 16 | **4.5–4.10** | Alkane Sources, Newman Projections, Conformational Analysis, Cycloalkanes |
| 11 | September 18 | **4.11–4.15** | Drawing, Mono- and Disubstituted Cyclohexanes, *Cis*-*Trans*, Polycyclics **•PS#4** |
| | September 19 Thursday | | **Midterm Examination I** (Chapters 1–4) E2–E3 (8:20–10:10 pm), FLI50 |
| 12 | September 20 | **5.1–5.4** | Isomerism Overview, Stereoisomerism, Chirality, the *R*,*S* System, Optical Activity |
| 13 | September 23 | **5.5–5.7** | Stereoisomeric Relationships, Symmetry, Fisher Projections, |
| 14 | September 25 | **5.8–5.11** | Conformational Mobility, Isomeric Relationships, Resolution, *E* and *Z* Descriptors |
| 15 | September 27 | **6.1–6.4** | Enthalpy, Bond Dissociation Energies, Entropy, Gibbs Free Energy, Equilibria **•PS#5** |
| 16 | September 30 | **6.5–6.7** | Kinetics, Energy Diagrams, Nucleophiles and Electrophiles |
| 17 | October 2 | **6.8–6.11** | Mechanisms, Arrow Pushing, Curved Arrows, Rearrangements, Reaction Arrows |
| 18 | October 4 | **6.12–7.2** | Substitution & Elimination Reactions, Alkyl Halides |
| 19 | October 7 | **7.3–7.4** | $S_N2$ Reactions, Nucleophile Strength **•PS#6** |
| 20 | October 9 | **7.5–7.6** | E2 Reactions, Alkene Stability |
| 21 | October 11 | **7.7–7.8** | E2 Regio- and Stereochemistry, $S_N1$ & E1 |
| 22 | October 14 | **7.9–7.10** | Substitution vs. Elimination, Other Substrates |
| 23 | October 16 | **7.11–7.12** | Synthesis Strategies, Solvent Effects **•PS#7** |
| | October 17 | Thursday | **Midterm Examination II** (Chapters 5–7) E2–E3 (8:20–10:10 pm), TURL005 |
| | October 18 | **Holiday** | Homecoming |
| 24 | October 21 | **8.1–8.3** | Addition Reactions, Alkenes, Nomenclature |
| 25 | October 23 | **8.4–8.6** | Addition vs. Elimination, Hydrohalogenation, Hydration |
| 26 | October 25 | **8.7–8.9** | Oxymercuration, Hydroboration, Hydrogenation |
| 27 | October 28 | **8.10–8.12** | Halogenation, Halohydrins, *Anti*-Dihydroxylation, *Syn*-Dihydroxylation |
| 28 | October 30 | **8.13–8.15** | Oxidative Cleavage, Product Prediction, Synthesis Strategies |
| 29 | November 1 | **9.1–9.5** | Alkynes, Nomenclature, Acidity, Preparation, Reduction **•PS#8** |
| 30 | November 4 | **9.6–9.11** | Alkyne Hydrohalogenation, Hydration, Halogenation, Ozonolysis, Synthesis Strategies |
| 31 | November 6 | **10.1–10.4** | Radical Mechanisms, Chlorination, Halogenation Thermochemistry **•PS#9** |
| 32 | November 8 | **10.5–10.9** | Halogenation Selectivity, Stereochemistry, Allylic Bromination, Ozone, Autoxidation |
| | November 11 | **Holiday** | Veterans Day |
| 33 | November 13 | **10.10–10.13** | Radical HBr Addition, Polymerization, Applications, Halogenation **•PS#10** |
| | November 14 | Thursday | **Midterm Examination III** (Chapters 8–10) E2–E3 (8:20–10:10 pm), FLI50 |
| 34 | November 15 | **11.1–11.7** | Synthesis, Functional Group Transformations, Carbon Skeleton, Retrosynthesis |
| 35 | November 18 | **12.1–12.4** | Alcohols and Phenols, Acidity, Preparation **•PS#11** |
| 36 | November 20 | **12.5–12.9** | Diol Preparation, Grignard Reagents, Protection, Phenol Preparation, Alcohol Reactions |
| 37 | November 22 | **12.10–12.13** | Reactions of Alcohols, Biological Redox, Phenol Oxidation, Synthesis Strategies |
| | November 25 | **Holiday** | Thanksgiving Break |
| | November 27 | **Holiday** | Thanksgiving Break |
| | November 29 | **Holiday** | Thanksgiving Break |
| 38 | December 2 | **13.1–13.8** | Ethers, Nomenclature, Preparation, Reactions, Epoxides, Nomenclature, Prep. **•PS#12** |
| 39 | December 4 | **13.9–13.12** | Reactions, Thiols, Sulfides, Synthesis **•PS#13** |
| 40 | December 10 | **Final Exam** | (Chapters 1–13) Tuesday, December 10, 10:00 am – 12:00 pm, SFH221 |

**Required Textbook:** David Klein. ***Organic Chemistry***, ***Fourth*** *Edition*; Wiley, **2021**. (ISBN 1119659590) https://www.amazon.com/Organic-Chemistry-David-R-Klein/dp/1119659590 (2nd Ed. is close enough. 3rd Ed. is better.)

**Recommended Student Study Guide:** David Klein. ***Student Study Guide and Solutions Manual to accompany Organic Chemistry****, Fourth Edition*; Wiley, **2021**. (ISBN 1119659582)
https://www.amazon.com/Organic-Chemistry-David-R-Klein/dp/1119659582

**Publisher's Sales Website**: https://www.wiley.com/en-us/Organic+Chemistry%2C+4th+Edition-p-9781119776741
**WileyPLUS Website**: https://learn.wileyplus.com/courses/168060

**Highly Recommended Model Sets:**
**HGS Maruzen** 1003Alpha/Organic Chemistry Basic Set
https://www.amazon.com/1003Alpha-Organic-Chemistry-Basic-Set-dp-0999722417/dp/0999722417 or
**HGS Maruzen** 1005Alpha/Organic Chemistry Standard Set
https://www.amazon.com/1005Alpha-Organic-Chemistry-Standard-Set/dp/0998549789 or
**Duluth Labs** Organic Chemistry Molecular Model Student Set - MM-004 (or MM-003 or MM-005)
https://www.amazon.com/dp/B01AJCPJLI
Duluth style models from other Amazon vendors: **Lulu**, **Swpeet**, **Yuntec**, **Linktor**, **Hilitchi**, **Dalton Labs**, **LogicLabs**.
But look for Organic sets rather than Organic/Inorganic sets.

**Supplementary Textbooks:** Organic Chemistry Textbooks by: Brown, Iverson, Anslyn, & Foote; Wade; McMurry; Vollhardt & Schore; Morrison & Boyd; Bruice; Hornback; Streitwieser & Heathcock.

**Canvas Website.** All students will have access to the Canvas website: https://elearning.ufl.edu/

You will login with your Gatorlink account username and password. This is where you will find general class information, important news, office hours, handouts, class notes, and keys. This is also where you will be able to find out your point totals and histograms.

**Class Requirements:**
1) Thirteen problem sets (20 points each; 240 points max; the **lowest** score will be dropped)
2) Six online quizzes (10 points each = 60 points)
3) Three midterm examinations (150 points each = 450 total)
4) Final examination (250 points) **= 1000 points total**

**Problem Sets.** Problem sets will be **due at 11:59 pm** on the designated due dates. Answer keys will be posted around this time. The format is multiple choice with 20 questions and your answers will be turned in as an Assignment on Canvas. The lowest of the thirteen scores will be dropped. You may work in groups or alone. But, you may not copy answers. The problem sets are mostly foundational material necessary for the examinations.

**In-class Quizzes.** The six quizzes, which will be **unannounced and randomly distributed** during the semester, will be short and are designed to encourage you to attend class and to keep up with the course. You will take them as an Assignment on Canvas after class. They should be easy for those who have attended class that day. The quizzes can only be taken the day they are announced. They cannot be made up without an official, written University excuse.

**Midterm Examinations.** There will be three midterm examinations and each will focus on the chapters designated. The midterms are not designed to be cumulative; but you should expect some natural amount of material from a previous midterm to be important and necessary. Please bring and display your Gator1 Card for the exams.

**Final Examination.** The final examination will be cumulative. To do well, it will be important to keep up during the semester and review all notes and assignments for the course. **Working problems—frequently and consistently**—may be the best overall approach to mastering the course material. You are strongly encouraged to work all of the **old exams** (posted on Canvas) as well as **end-of-chapter problems** from our textbook, and the others listed above. Please bring and display your Gator1 Card for the final.

**Assignment Regrading.** If you have a question concerning the grading of an assignment, you may submit the entire assignment for complete regrading. The assignment must be submitted for regrading by the next class meeting after the date the assignment was returned to the class.

**Online Lecture Notes (Templates)** will be available on Canvas (see above) in pdf format. They are organized by book chapter. The Lecture Notes show important course material, but have blank space for your notes to be taken during lecture. This method is designed to require less time writing and allow more time thinking. Students are encouraged to download and/or print the Lecture Notes and bring them to class to facilitate notetaking.

**Office Hours.** Subject to change, office hours will be held **Thursdays from 3:00 pm – 3:50 pm** in **Sisler Hall 340** (third floor, southeast corner). Occasionally, a student TA will substitute for Dr. Miller and notice of this should be posted online. If you find 340 empty, please find Dr. Miller in his regular office. Additional office hours will likely be held **following class on Mondays and Wednesdays** in our regular classroom—schedule permitting. Additionally, office hours will likely be conducted by undergraduates who have completed the 2212/2213 sequence previously. Students are encouraged to visit the Organic Chemistry Learning Center, located in SFH 205. This Center is staffed with Graduate Student Teaching Assistants in the mornings and afternoons Monday–Friday. The open hours of the OCLC are roughly 8:30 am to 6:00 pm and the final schedule will be posted on Canvas.

**Conflict Examinations.** *Conflict examinations* will be given only for University-excused absences provided the appropriate documentation is supplied. Conflict exams are ideally administered *before* the regularly scheduled examination—not after. See: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

**Attendance.** Attendance for this class is not recorded. However, the six unannounced and random quizzes will generally reflect your attendance pattern.

**Class Numbers.** To facilitate the grading and return of exams, I request that you write your name and **class number** on each one. The class numbers will be assigned before the first exam.

**Grading.** Grades will be curved based on points earned out of 1000. The curve will be based on the distribution and any result is possible. Everyone could receive A's; everyone could receive D's. There is no individual penalty for a class that performs well. For the eight semesters that have I taught CHM 2212 and CHM 2213, the grade distributions are below. Note that the percent of students receiving some kind of A has varied from 34% to 55%. Additional information about UF grading policies can be found here: https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/

**Fall 2016 (CHM 2212):**

| Grade | # | percent |
|---|---|---|
| A | 14 | 34.1 % |
| A- | 5 | 12.2 % |
| B+ | 3 | 7.3 % |
| B | 11 | 26.8 % |
| B- | 1 | 2.3 % |
| C+ | 4 | 9.8 % |
| C | 0 | 0.0 % |
| C- | 0 | 0.0 % |
| D+ | 0 | 0.0 % |
| D | 1 | 2.4 % |
| D- | 1 | 2.4 % |
| F | 1 | 2.4 % |
| Total | 41 | 100.0% |

**Spring 2017 (CHM 2213)**:

| Grade | # | percent |
|---|---|---|
| A | 7 | 18.4 % |
| A- | 7 | 18.4 % |
| B+ | 5 | 13.2 % |
| B | 10 | 26.3 % |
| B- | 3 | 7.9 % |
| C+ | 4 | 10.5 % |
| C | 1 | 2.6 % |
| C- | 0 | 0.0 % |
| D+ | 0 | 0.0 % |
| D | 0 | 0.0 % |
| D- | 0 | 0.0 % |
| F | 1 | 2.6 % |
| Total | 38 | 100.0% |

**Fall 2017 (CHM 2212):**

| Grade | # | percent |
|---|---|---|
| A | 10 | 26.3 % |
| A- | 8 | 21.1 % |
| B+ | 8 | 21.1 % |
| B | 3 | 7.9 % |
| B- | 3 | 7.9 % |
| C+ | 4 | 10.5 % |
| C | 0 | 0.0 % |
| C- | 0 | 0.0 % |
| D+ | 0 | 0.0 % |
| D | 1 | 2.6 % |
| D- | 0 | 0.0 % |
| F | 1 | 2.6 % |
| Total | 52 | 100.0% |

**Spr. 2018 (CHM 2213)**:

| Grade | # | percent |
|---|---|---|
| A | 10 | 26.3 % |
| A- | 3 | 7.9 % |
| B+ | 6 | 15.8 % |
| B | 6 | 15.8 % |
| B- | 8 | 21.1 % |
| C+ | 1 | 2.6 % |
| C | 1 | 2.6 % |
| C- | 0 | 0.0 % |
| D+ | 0 | 0.0 % |
| D | 0 | 0.0 % |
| D- | 0 | 0.0 % |
| F | 0 | 0.0 % |
| Total | 35 | 100.0% |

**Fall 2018 (CHM 2212):**

| Grade | # | percent |
|---|---|---|
| A | 10 | 27.0 % |
| A- | 5 | 13.5 % |
| B+ | 7 | 18.9 % |
| B | 5 | 13.5 % |
| B- | 3 | 8.1 % |
| C+ | 4 | 10.8 % |
| C | 2 | 5.4 % |
| C- | 0 | 0.0 % |
| D+ | 0 | 0.0 % |
| D | 1 | 2.7 % |
| D- | 0 | 0.0 % |
| F | 0 | 0.0 % |
| Total | 37 | 100.0% |

**Spring 2019 (CHM 2213):**

| Grade | # | percent |
|---|---|---|
| A | 10 | 25.6 % |
| A- | 5 | 12.8 % |
| B+ | 7 | 18.0 % |
| B | 13 | 33.3 % |
| B- | 2 | 5.1 % |
| C+ | 0 | 0.0 % |
| C | 2 | 5.1 % |
| C- | 0 | 0.0 % |
| D+ | 0 | 0.0 % |
| D | 0 | 0.0 % |
| D- | 0 | 0.0 % |
| F | 0 | 0.0 % |
| Total | 39 | 100.0% |

**Fall 2019 (CHM 2212):**

| Grade | # | percent |
|---|---|---|
| A | 19 | 35.9 % |
| A- | 6 | 11.3 % |
| B+ | 6 | 11.3 % |
| B | 6 | 11.3 % |
| B- | 5 | 9.4 % |
| C+ | 3 | 5.7 % |
| C | 3 | 5.7 % |
| C- | 4 | 7.5 % |
| D+ | 1 | 1.9 % |
| D | 0 | 0.0 % |
| D- | 0 | 0.0 % |
| F | 0 | 0.0 % |
| Total | 53 | 100.0% |

**Spr. 2020 (CHM 2213):**

| Grade | # | percent |
|---|---|---|
| A | 20 | 37.0 % |
| A- | 10 | 18.5 % |
| B+ | 7 | 13.0 % |
| B | 6 | 11.1 % |
| B- | 4 | 7.4 % |
| C+ | 2 | 3.7 % |
| C | 4 | 7.4 % |
| C- | 0 | 0.0 % |
| D+ | 0 | 0.0 % |
| D | 0 | 0.0 % |
| D- | 0 | 0.0 % |
| F | 1 | 1.9 % |
| Total | 54 | 100.0% |

**Accommodations for students with disabilities.** Students requesting academic/classroom accommodations should connect with the Disability Resource Center. https://disability.ufl.edu/get-started/ The obtained accommodation letter should be discussed with the instructor as soon as possible in the semester.

**Course Evaluations.** "Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/."

**UF Honor Code: We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.**

On all work submitted for credit by students at the university, the following pledge is either required or implied: **"On my honor, I have neither given nor received unauthorized aid in doing this assignment."** "The university requires all members of its community to be honest in all endeavors. A fundamental principle is that the whole process of learning and pursuit of knowledge is diminished by cheating, plagiarism and other acts of academic dishonesty. In addition, every dishonest act in the academic environment affects other students adversely, from the skewing of the grading curve to giving unfair advantage for honors or for professional or graduate school admission. Therefore, the university will take severe action against dishonest students. Similarly, measures will be taken against faculty, staff and administrators who practice dishonest or demeaning behavior."

**Cheating and Plagiarism.** Cheating and/or plagiarism will not be tolerated. The minimum penalty will be an automatic zero on the assignment in question. Suspension from the University may also result. Do not risk it. It is not worth it. Plagiarism consists of passing off as one's own the ideas, words, writings, etc. that belong to someone else. You are committing plagiarism if you copy the work of another person and turn it in as your own, even if you have that person's permission.

See: https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/

**Privacy.** Our class sessions may be audio-visually recorded for the use of enrolled students. Students who participate during class are agreeing to have their audio or video recorded. As in all courses, unauthorized recording and unauthorized sharing of recorded materials are prohibited.

**Absences.** Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. To find more information on the university attendance policies, click here https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/.

**UF Syllabus Policy.** The UF *Policy on Course Syllabi* can be found here: https://syllabus.ufl.edu/media/syllabusufledu/UFSyllabusPolicy20240806.pdf

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