CHEM 231 – ORGANIC CHEMISTRY FOR MOLECULAR-BASED SCIENCES: PART 1 – FALL 2026

1. COURSE SECTIONS

Section	11
CRN	28948
Class day/time	MWF 1:00 – 1:50 am
Location	FB 142

2. INSTRUCTOR AND TA INFORMATION

Instructor	Dr. Sundeep Rayat
Address	Department of Chemistry, Ball State University, Muncie, IN
Office	Foundational Sciences Building 502
Email	srayat@bsu.edu
Phone	765-285-8308
Office Hours	MW 2 – 3 pm; T 12:30 – 1:30 pm or by appointment

SI Leader	**Grant Miller**
Email	grant.miller3@bsu.edu
SI Sessions	M, W 5 – 5:50 pm
SI Location	TBD
Office hours	F 2 – 3 pm

TA	**Bryce Peters**	**Eden Hammond**
Email	bryce.peters@bsu.edu	eden.hammond@bsu.edu
Office hours	TBD	TBD
Location	TBD	TBD

2.1 OFFICE HOURS. I will hold office hours twice per week. Your TAs will also hold office hours each week. I will offer 0.25 extra credit (up to 2.5 points for the entire semester) if you come to either my office hours or TAs' office hour and ask a question from the **assigned textbook problems**. You can only earn a maximum of 0.5 point per day for asking two questions. Your TAs and I will keep record of your visits and assign these grades at midterm or at the end of the semester.

2.2 SI SESSIONS. Your SI leader, Grant Miller will hold two study sessions per week during the semester. During these, Grant will give you a problem-set to work on. I will offer 0.1 point extra credit for attending each session for up to 2.5 points for the entire semester (25 sessions). You must stay for at least 30 minutes when you attend to receive this credit. Grant will have a sign-in sheet to keep track of your attendance.

3. COURSE INFORMATION

3.1 COURSE DESCRIPTION. First course in a two-semester sophomore level sequence which focuses on introductory organic chemistry. This first semester will focus on structure and fundamental properties of organic molecules, and will introduce principles of reactivity. Designed for chemistry majors, pre-professional majors requiring organic chemistry, and other molecular science-based majors.

3.2 PREREQUISITES. CHEM 112 with a grade of C or better. Parallel: CHEM 241.

3.3 COURSE OBJECTIVES. CHEM 231 is designed to introduce students to the fundamental principles of organic chemistry including structure and reactivity. It is expected that students in CHEM 231 will continue to CHEM 232, the second semester of this two-semester introductory organic chemistry course. This two-course sequence should provide students with a much more detailed and complete presentation of organic chemistry than the related one-semester course CHEM 230. We will study the structure, bonding and reactivity of different classes of organic compounds including alkanes, alkenes, alkynes, and alkyl halides. These compounds play an important role in everyday life. For instance, methane, a natural gas in our homes, belongs to the alkane family. Ethylene, a plant hormone used for ripening of bananas belongs to the alkene family. Ethanol is an alcohol used as fuel and sanitizer. It is also contained in wine and beer. Isobutanol, another type of alcohol is used as solvent in paints, varnish removers and inks. Most medicines are organic compounds that engage in organic reactions in our body to make us feel better. By the end of this course, students will accomplish the following Learning Objectives:

- Describe bonding in organic molecules using various models and predict molecular geometry.
- Interpret and draw structures of organic molecules using a variety of representations, such as Lewis structures, skeletal structures, condensed structures, Newman projections, chair conformations, etc. and transform structures given in one representation into a different representation while preserving the correct regio- and stereochemistry.
- Analyze intermolecular interactions to describe molecular properties.
- Use curved arrows to interconvert resonance structures and draw mechanisms for organic reactions.
- Predict acidity and basicity trends of organic compounds.
- Apply IUPAC nomenclature to name organic molecules.
- Analyze and compare different conformations of organic molecules, evaluating relative stability and energy differences using Newman projections and chair conformations.
- Identify chirality centers, determine R/S configuration, distinguish between various stereoisomers and analyze how mixtures of stereoisomers affect optical activity.
- Identify and predict the reactants, reagents, and products involved in S_N1, S_N2, E1, and E2 reactions.
- Identify and predict the reactants, reagents, and products involved in the addition reactions of alkenes and alkynes.
- Use fundamental organic reactions to construct multi-step synthetic pathways for small molecules.

3.4 COURSE STRUCTURE. This course will utilize a *student-centered*, *active learning* environment, also called flipped classroom. Students will work in groups of 3-4 persons each outside and inside the class. Each group is identified by an element. The information about your "element" is posted on Canvas. Contact your group members before Monday, **August 31** and set-up meeting times on Zoom. You will discuss Active Learning Questions (ALQs) during this time as explained below in STEP 2.

**In the past years, students have found these small group study sessions to be extremely beneficial as they provide a space to collaborate, discuss challenges, and work through problems together. These meetings also help build a sense of accountability, as group members rely on each other to stay engaged and on track. While participation is strongly encouraged, these are not required. If you're unable to meet with your group, please let me know as soon as possible so we can find an alternative individual assignment for you to earn the points.*

About conducting and recording Zoom meetings: You can create an account for free at https://bsu.zoom.us/ if you already don't have a BSU *Zoom* account. The pre-class "Zoom meet-up" assignment will be recorded, and the recordings will be submitted for participation points along with the *Audio Transcript*. Files submitted without the *Audio Transcript* will not be graded (such as mp4 files). Here are the instructions to do so:

- One student hosts/schedules the Zoom meeting and invite other group members.
- Before starting the meeting, the host logs-in to their account at bsu.zoom.us and goes to Settings, and then, click on 'Recordings' to make sure 'Record to the Cloud' option is on.
- The host starts the meeting and other group members join. All are encouraged to turn on their video

- The host starts recording and select "**Record to the Cloud**" option.
- Everyone says their name clearly at the beginning and the Active Learning Questions (ALQs) are discussed.
- The meeting uses screen sharing (Important!)
- Everyone says their name once again before ending the recording/meeting.
- The host gets an email with a link to "Share the recording with viewers"
- The host submits that link on Canvas on behalf of the entire group and include passcode (if there is one).

How Will This Course Go?

This *active learning or flipped course* follows a 5-step structure for each class. Steps 1–2 are done before class (as a part of HOMEWORK), Step 3 during class, Step 4 after class (ideally the same day), and Step 5 on the weekend. Modules on Canvas are organized for each class period accordingly,

STEP 1: WATCH THE LECTURES: You will watch assigned pre-recorded lectures before the class as listed under each module (*Note: On average you will be spending 30 minutes watching videos before each class, with some videos being as short as 10 minutes and about 3-4 close to 50 minutes*). An outline of the lecture PowerPoint is available under each module. You must use these to take notes as you listen to the recorded lecture as if you were in the actual class. Remember that the best way to learn organic chemistry is to **practice, practice and practic**e. Draw the structures/mechanisms/reactions as you study them, whether you use textbook, recorded lectures, or are in class. I will offer 0.25 extra credit (up to 2 points for the entire semester) for each chemistry related error you find in the recordings (spelling mistakes don't count). To get credit, post the error in the appropriate discussion on Canvas with the video title, a screenshot showing the error, the time the error occurred and a proposed correction. Only one student can get credit for a given error. Therefore, check the discussion page before posting the error to ensure you are first to report it. (Note: A few recordings were made for an older edition of the textbook, so the Section numbers in the recording itself are incorrect. Please don't report that as an error.)

STEP 2: PRE-CLASS ASSIGNMENT: You are strongly encouraged to meet with your group on *Zoom* (prior to class) at a mutually agreed time and discuss the assigned ALQs in the module. You will RECORD THE MEETING as explained above and upload a link to the recording under the respective discussion on Canvas for participation points. One recording per group will be submitted.

- *Zoom meetings can last anywhere from 5 to 30 minutes, depending on the group's level of engagement and how much they choose to discuss.*
- *Remember, I'll be listening to the Zoom discussions—so stay focused and avoid bringing up anything you wouldn't want me to hear.*

STEP 3: CLASS TIME: You will come to the class, sit with your group members and we will discuss the assigned questions as well as a few new ones that you will only get during class. At that time, you can also ask me questions that came up during your discussions with your group over Zoom.

STEP 4: DO TEXTBOOK PROBLEMS AFTER THE CLASS: Finally, you will practice the assigned **conceptual checkpoint and skill builder problems** from the textbook the same day to reinforce learning. It is EXTREMELY IMPORTANT that you attempt to do the problems in each module before the next class/module to keep-up with the material.

STEP 5: ON THE WEEKEND. Each Friday module will include assigned textbook practice problems based on week's content. You are expected to complete these **weekend** problems to gradually prepare for the next exam.

4. COURSE MATERIALS

- REQUIRED *Organic Chemistry* 5th Ed with Integrated Solutions Manual Author: David R. Klein.
- REQUIRED Access to WileyPLUS Platform
- REQUIRED Computer or a tablet.
- RECOMMENDED *Molecular Model Set.*

5. COURSE SCHEDULE

Following chapters from the textbook will be covered. Detailed schedule can be found on Course Canvas page.

Chapter 1	A Review of General Chemistry: Electrons, Bonds, and Molecular Properties
Chapter 2	Molecular Representations
Chapter 3	Acids and bases
Chapter 4	Alkanes and Cycloalkanes
Chapter 5	Stereoisomerism
Chapter 6	Chemical Reactivity and Mechanism
Chapter 7	Alkyl Halides: Substitution Reactions & Elimination Reactions
Chapter 8	Addition Reactions of Alkenes
Chapter 9	Alkynes

6. COURSE ASSIGNMENTS

6.1 PARTICIPATION POINTS. This course is designed to include discussion and collaboration with your classmates. *Class discussions:* You are expected to participate in canvas discussions with your classmates and earn participation points. These will be worth 3 points. Each discussion will be between 1 – 2 points.

In-class attendance: You are expected to attend every class and participate in discussions. During the semester, I will take attendance on 20 random days using the *aPlus+ Attendance* feature on canvas. You will receive a grade of 0.25 point each time. Thus, you can earn up to 5 points by showing up to the class.

Pre-class assignments: There will be 30 times during the semester when you are encouraged to meet-up with your group (or submit an individual assignment) to discuss ALQs on Zoom (as a part of STEP 2 discussed above) and upload recordings. The lowest 10 group meet-up participation points will be dropped. You will receive 1/1 points for your presence in the twenty Zoom meetings over 15 weeks. Additional 0.1 extra points (per meeting) will be added if you were an active participant in the meeting and if your Zoom meeting lasted at least **20 minutes** to discuss ALQs. Thus, you can accumulate 2 points as extra credit in these Zoom meetings. Note that active participation means, sharing ideas, asking questions, engaging in discussions, and rebutting others. You **must use screen sharing** while discussing your questions. If your group does not use screen sharing, all group members will only receive 50% credit for that day (1/2) and forfeit any extra credit. All meeting recordings will be due by 11:59 pm on the day before the class meets to discuss that Module. The first Zoom recording is due on **September 2**.

6.2 ORGANIC MOLECULES AROUND US – AUTHENTIC ASSIGNMENT – INFOGRAPHIC. Authentic assignments are "real", meaning it connects the material that we learn in class to the world around us. For these assignments, you will have to pick an organic molecule of interest to you that has some medicinal, cosmetic, food, industrial or agriculture value. First, you will be asked to share some preliminary information about this compound (name, uses etc.) on the discussion board. This will ensure that no two students pick the same compound for a given assignment. It is always a good idea to post as early as possible to avoid a conflict and, have a back-up molecule just in case. Later in the semester you will gather additional information on your compound and finally, you will design an infographic to share information about your compound. These will be submitted on Canvas and may require structure drawings which can be completed by hand drawing on a blank paper or using a Chemical Structure Drawing tool, scanned into a pdf file and then, uploaded on Canvas.

Authentic assignment	**Due @ 11:59pm**
Part 1	October 14
Part 2	October 30
Part 3	November 23

6.3 HOMEWORK ASSIGNMENTS . We will use WileyPLUS for homework assignments accessible through Canvas. Homework assignments, worth 50 points, will be combination of *adaptive assignments* or *question set* type. The type of the problems on these assignments will prepare you for the quizzes/exams. For the *question set* assignments, late submission is allowed but it will be subjected to 25% penalty after the due date and further 25% if submitted after 2 days. *Adaptive* assignments will not be subjected to late penalty. In *adaptive assignments*, the number of questions you get will be based on your performance. These will be worth 5 points. You will receive 5 points for 100% progress, 4 points for 80 – 99.99% progress, 3 points for 50 – 79.99% progress and 0 point for <50% progress. In *question set* assignments, there will be fixed number of questions.

You will get 15 attempts for structure drawing or short answer type questions with no point deduction for each failed attempt. For multiple choice questions, you will get 4 attempts, with 50% point deduction after the 2nd attempt. The schedule for these assignments is below.

Question set/Adaptive	Due @ 11:59pm
Homework 1	September 4
Homework 2	September 14
Homework 3	October 2
Homework 4	October 21
Homework 5	November 4
Homework 6	November 13
Homework 7	November 30

Need help? *To contact technical support, go to:* https://wpsupport.wiley.com/s/
You can 'Submit a Case' or start chatting with the support team by clicking on the icon on bottom right.

6.4 QUIZZES. All quizzes will take place on Canvas. To access these, you will be required to download ***Respondus Lockdown Browser***. This can be done from the help menu on the left side on Canvas. Syllabus quiz allows you to practice using the Respondus Lockdown Browser without the pressure and time constraints imposed by an actual quiz. Syllabus quiz (5 points) will be taken virtually and a printed copy or notes can be used. ***All other quizzes will be in class and closed book, closed notes***. Quizzes 1 – 4 will be between 20 - 40 points. The duration of the quizzes will be 20 - 30 minutes. After the time is up, the quiz will be automatically submitted. Following is the schedule for the quizzes:

Quiz	Date
Syllabus quiz (Virtual)	August 26 (due 11:59 pm)
Quiz 1 (In-class)	September 9
Quiz 2 (In-class)	October 9
Quiz 3 (In-class)	November 6
Quiz 4 (In-class)	December 2

6.5 EXAMINATIONS. There will be three midterms, 100 points each and a final worth 160 points. Exams are also closed-book, closed notes. Following is the schedule for the exams:

Exam	Date
Exam 1(In-class)	September 18
Exam 2(In-class)	October 23
Exam 3(In-class)	November 16
Final Exam (In-class**)**	**December 11 (12pm – 2pm)**

6.6 CONCEPTUAL CHECKPOINT, SKILL BUILDERS AND PRACTICE PROBLEMS FROM YOUR TEXTBOOK. The key to mastering organic chemistry is to take responsibility for your own learning. ALQs discussed in class are not enough to succeed in this class. It is absolutely necessary to work on as many problems from the textbook as possible. The suggested **conceptual checkpoint and skill builder problems** for each Module should be done before the next class session. The practice problems at the end of the chapter should be done on the weekends as indicated in respective Modules to further reinforce your understanding. These will not be collected or graded.

Advice for success

- In addition to the recorded lectures, use your textbook to learn. **Study a small piece (one section) of the chapter at a time** -- study it well enough to pass a test immediately after. A section usually is about the "right size" for our brains. Stop at the end of that section and test yourself by doing suggested **conceptual checkpoint and skill builder problems** right away (**without peeking at the answers**). Make sure that you remember what you need to remember from that section to pass a test. If you're not sure, go back and rewatch the relevant video or restudy the section, and then test yourself again by doing the same problems.
- Ony use **a solution manual to check the answers**, and not to study/answer questions. If you cannot solve a problem, first reread the relevant section of the chapter (or rewatch the relevant videos) and then retry. If you do have to look up the answer in the solution manual, mark that problem and go back to it the next day.
- A few days before the exam, redo the suggested problems for the chapters to be covered on the test.

7. COURSE ASSESSMENT

There will be four quizzes (20–40 points each) and three midterms (100 points each). The final exam will be **comprehensive**, covering all material from the beginning of the semester, and will be worth 160 points. Quizzes will consist entirely of multiple-choice and matching questions. Midterms and the final exam will include a mix of multiple-choice, matching, structure drawing, and short-answer questions. The total points for the ten homework assignments will be 65. Group participation or an alternative individual assignment will be worth 40 points. You'll also complete one authentic assignment worth 20 points. You can earn up to 15 points for class attendance (see Section 8.3), and Canvas discussions will contribute an additional 5 points. Finally, there will be a syllabus quiz due **August 26 (11:59pm)**, worth 5 points. Your final grade will be based on a total of **700 points**, distributed as follows:

Assessment type	**Points**	**%**
Midterms	300	43
Final	160	23
Quiz	145	21
Wiley homework assignments	50	7
Pre-class assignments (Group participation recording or alternative individual assignment)*	20	3
Authentic assignment	10	1
Attendance	5	1
Canvas discussion	5	1
Syllabus	5	1
Total	**700**	**100**

The grading scale will be determined on the basis of an overall percentage score. The approximate cut-off ranges for letter grade are as follows (I reserve the right to modify these slightly as necessary):

A	100 – 91	B+	<89 – 87	C+	<78 - 76	D+	<67 – 65		
A-	<91 – 89	B	<87 – 80	C	<76 – 69	D	<65 – 58		
		B-	<80 – 78	C-	<69 – 67	D-	<58 – 56	F	< 56

8. UNIVERSITY POLICIES AND STANDARDS

8.1 UNIVERSITY STATEMENT. We are committed to ensuring that all members of the community are welcome, through valuing the various experiences and worldviews represented at Ball State and among those we serve. We promote a culture of respect and civil discourse.

8.2 DISABILITY STATEMENT. If you need course adaptations or accommodations because of a disability, please contact the instructor of record as soon as possible. Ball State's Disability Services Office coordinates services for students with disabilities; documentation of a disability needs to be on file in that office before any accommodations can be provided. Disability Services can be contacted at 765-285-5293 or dsd@bsu.edu.

8.3 FREEDOM OF EXPRESSION. In this course, we are committed to fostering a learning environment that values intellectual diversity, encourages free expression, and promotes open inquiry. As members of the Ball State Community, we treat each person in the Ball State community with civility, courtesy, compassion, and dignity and respect and learn from differences in people, ideas, and opinions. Please review Ball State University's Statement on Freedom of Expression, the resources on Ball State's Freedom of Expression webpage, and Ball State's Beneficence Pledge.

In the context of this class, **Freedom of expression** means being able to ask questions, offer ideas, propose new hypotheses or engage in open discussions without judgment. It encourages a healthy learning environment where we grow by experimenting—both in lab and in thought. This freedom fuels innovation and scientific discovery. While chemistry is grounded in fundamental principles, anomalies and unexpected results do occur. Scientists must feel free to explore and publish unconventional ideas if they are supported by **evidence-based research**. Scientific knowledge evolves through debate, experimentation, and replication. Therefore, in chemistry, it is not just about expressing an idea—it is about backing it with data, peer-reviewed studies and logical reasoning. Feel free to search the scientific literature to explore different viewpoints, verify results or expand your own understanding of concepts/techniques covered in this course.

8.4 ATTENDANCE. Students are expected to have regular and punctual class attendance. Attendance will be tracked using the a+ Attendance feature on Canvas, and your TAs will also be recording it. Do not share attendance codes with anyone not in class — we will be cross-checking, and **any misuse will result in losing attendance points for the entire semester**. Accommodations for student absences will be made according to the university polices as listed here. If you are forced to miss a class, assignment, quiz or an exam due to a family emergency, serious illness, BSU activity or other unforeseen circumstances, you must inform me in advance *via* email or as soon as possible after the absence begins. You may need to provide documentation (with confidential information redacted when appropriate) if requested. If I decide that you have a legitimate reason for missing a quiz or an exam, you will be assigned a grade for that quiz or exam based upon your average grade for the remaining quizzes or exams (including the comprehensive Final Exam), respectively. For other assignments, due dates will be extended in case of excused absences. This policy does not apply if you were to miss the Final Exam.

9. STUDENT SUPPORT SERVICES

Students can benefit from free tutoring and coaching at the Learning Center, mental health assistance at the Counseling Center, and assistance with basic needs at the Basic Needs Hub.

10. CANVAS AND STUDENT PRIVACY

10.1 CANVAS ACCESSIBILITY. Canvas provides a user experience that is easy, simple, and intuitive. Special attention has been paid to making Canvas screen-readable. The Rich Content Editor encourages users to create accessible content pages (i.e. text formatting is accomplished using styles). Canvas is designed to allow limited customization of colors and schemes to be accessible for all users. The National Federation of the Blind granted Canvas the Gold Level Web Certification in 2010. Find more information by visiting the Canvas Voluntary Product Accessibility Template (VPAT).

10.2 FERPA AND PRIVACY. As a student, your educational records are considered confidential. Under FERPA (Family Educational Rights and Privacy Act), your records are confidential and protected. Under most circumstances, your records will not be released without your written and signed consent. However, some directory information may be released to third parties without your prior consent unless a written request to restrict this is on file. You can learn more about student rights to privacy by reading Ball State's FERPA and Privacy and Protection.

11. COURSE EXPECTATIONS AND POLICIES

11.1 COURSE PARTICIPATION EXPECTATIONS

- Make sure you have an on-time arrival and your complete attention in class (Class ends at 11:50 am)
- Don't just watch me do things. Draw structures as I draw them, take notes. That is the best way to learn!
- All of us have different learning abilities. Typically, to do well in this class, on average students spend:
  - 2 – 2.5 hours of serious studying for each class (Watching lecture, group meet-up/alternative assignment, doing the conceptual checkpoint and skill builder problems, and
  - 3 – 4 hours of serious studying on each day on the weekend.

11.2 FEEDBACK POLICY

- I will respond to your email within 24 hours during weekdays (Monday-Friday) and within 48 hours on the weekend (barring unforeseen circumstances).
- I will typically grade your assignment/exams within 5 school days of submission (barring unforeseen circumstances).
- Grades for Zoom recordings will be posted biweekly.
- Contact me directly if you have questions or concerns about your performance in class.

11.3 LATE ASSIGNMENT POLICY

- Late assignments are only permitted under extenuating circumstances as indicated in section 8.3.
- Wiley homework assignments submitted after the indicated due date will be subject to late penalty as listed in section 6.3.
- All other assignments submitted after the posted due date will be subject to a 10% deduction from the assignment grade for each calendar day they are late. After 5 calendar days, the assignment will no longer be accepted and will receive a score of 0. Example: An assignment that earns 90/100 points but is submitted 1 calendar day late will receive 81/100 points (a 10% deduction). If the same assignment is submitted 2 calendar days late, it will receive 72/100 points (a 20% deduction). If it is submitted 3 calendar days late, it will receive 63/100 points (a 30% deduction) and so forth. Assignments submitted more than 5 calendar days after the due date will not be accepted.
- Internet connectivity and technical issues may occur and impede you from submitting work on time. Turn in work early and often, and set up a back-up plan, such as visiting a local library or borrowing a peer's computer.

12. SUBJECT TO CHANGE STATEMENT

This syllabus is subject to change in the event of extenuating circumstances.