Marshall University Syllabus
College of Science
Chemistry

Course/Term

CHM 305 Research Methods Fall 2023

Instructor

Dr. Rosalynn Quiñones

Contact Information

- Office: Science Building S 496
- Office Hours: Tuesdays and Wednesdays 10:00 am – 11:00 am, and Thursdays 11:00 am – 12:00 pm or by appointment in person/online using *Microsoft Teams.* I welcome drop-in visits but cannot guarantee that I will be available to help you during non-office hours. Simple questions can be answered via email.
- Office Phone: 304-696-6731
- Marshall Email: quinonesr@marshall.edu

Course Description

A course concerning the search and use of chemical literature, ethical issues relating to scientific research, proposal writing, scientific presentations, and proper scientific laboratory conduct.

Credits
1 credit hour-Undergraduate

Prerequisites
Grade of C or better in CHM 356.

Format (and Meeting Days/Times/Location)

Science building S 470, Wednesdays 12:00 – 12:50 pm. Sometimes we will meet on Mondays or Fridays at noon (refer to course schedule). This course should be completed in one Fall term.

Academic Calendar

For beginning, ending, and add/drop dates, see the Marshall University Academic Calendar

Academic Calendar Fall 2023

I have an Open Communication Policy: If you are having trouble with a problem, concept, or anything in class related please do not hesitate to email me. I try to respond to emails within 24 hours, but there are no guarantees. Class announcements may occasionally be made via email to your university email address. Please check it regularly. You must have and use your MU email account. Your personal email accounts will not be used for official communication with Marshall University programs and personnel. You may redirect your MU email to your own personal email account, but you must sign into your MU account to do that**.** Marshall University uses Office 365 email. For more information, visit Marshall IT: Office 365 (URL https://www.marshall.edu/it/office365/). Lecture notes and handouts will be posted at MU online as time permits.

Health and Safety Information

All members of the Marshall University community are expected to always observe health and safety protocols. This includes general health and safety protocols as well as specific protocols that might emerge in response to community and campus health conditions.

Required and/or Recommended Texts and Materials

All materials are posted in MU online (https://www.marshall.edu/design-center/).

Course Student Learning Outcomes

The table below shows the following relationships: How each student learning outcome will be practiced and assessed in the course.

Course student learning outcomes	**How students will practice each outcome in this course**	**How student achievement of each outcome will be assessed in this course**
Students will learn about ethics in science	group discussion, in-class exercises, assigned reading, online exam	Ethics paper CITI exam
Students will select a topic for their research proposal or literature paper	Lecture, discussions	Research proposal or literature paper
Students will read and present research publications	Lecture, group discussion	Presentations

Course Requirements/Due Dates

EVENT	SUBMISSION / GUIDELINES	DEADLINE
Class Orientation	Attendance signature required	**Wednesday, August 24**
Advisor Selection	Turn in fillable forms by email before 5:00 pm	**Friday, September 1**
Final draft of the Ethics Paper	Submit in MU online/Course Content folder by 11:59 pm	**Friday, September 29**
CITI Ethics course	Certificate Submitted by email before 5:00 p.m.	**Friday, October 6**
PowerPoint slides for scientific paper presentation	Submit in MU online/Course Content folder by **11:30 am**	**Monday, October 23**
Send Research proposal draft to mentor	Submit by email to the mentor and cc me in the email	**Tuesday, November 14**
Draft Research Proposal/Literature Review	Submit in MU online/Course Content folder by 11:59 pm	**Friday, November 17**

EVENT	SUBMISSION / GUIDELINES	DEADLINE
Paragraph with comments/questions about Research presentations	Submit in MU online/Course Content folder by 11:59 pm	**Friday, November 17**
Final Draft of Research Proposal/ Literature Review	Submit in MUOnline/Course Content folder by 11:59 pm	**Monday, December 4**

Course Policies

By enrolling in this course, you agree to the following course policies:

Attendance/Participation Policy

Attendance is required for all class meetings. While it is possible to make up the missed tutorial in the chemistry literature portion of the class, even excused absences will cause problems in the ethics portion of the class because there is only one meeting per topic. Thus, it will be impossible for you to take away from the class what we hope you will learn if you miss classes. COVID-19 related absence will be treated as an excuse.

Grading Policy

Grading Scale

There are 5 tasks/assignments in this course:

1. writing a literature review or research proposal,
2. presenting the proposal/review to the class,
3. oral presentation of an assigned scientific research publication,
4. taking and passing the CITI ethics course,
5. writing the ethics paper, and
6. participating in the ethics discussion.

The two written assignments (1 and 5) and each oral presentation (2 and 3) will be graded. CITI ethics course (4) will be part of the class's assessment. Each missed assignment will result in a one-letter grade reduction in your course grade. Each unexcused absence after the first unexcused absence will result in a letter grade reduction. Graded assignments turned in late will have their grades reduced by one letter grade per day. After three (3) days, the assignment will not be accepted.

Late Work Policy

There are due dates for several ungraded assignments and there will be consequences for turning them in late.

2. If your peer review of an assignment arrives after the due date and time, the grade on your paper will be reduced by one-half letter grade for each 12-hour increment.
3. For the CITI ethics course, your course grade will be reduced by one-half grade per 24-hour period after the due/date and time.

Evaluation Criteria

Grading Scale:

90-100%	A
80-89%	B
70-79%	C
60-69%	D
Below 60%	F

Grading:
Research Proposal or Literature Review: 40%
Ethics paper: 35%
CITI course: 5%
Oral presentation (2, each one worth 10%): 20%

Preface

When a research chemist develops an idea for an experiment, that person will almost always check the literature to find if someone else has already attempted it or something closely related. If not, information about how to go about achieving the researcher's goal will almost always be found there. Several databases have been compiled to facilitate such searches. Experience will teach you to view each search from several angles, but at the beginning, it is important to simply learn what kinds of information are stored in each database and how to retrieve it.

You will do most of your searches on SciFinder Scholar® or PubMed®. After a tutorial, you will learn to search the primary chemical literature by working with one faculty member on a project relating to her or his research.

Ethics

Finally, this course has an ethics component. There are several different projects in which you will participate.

1. Students will take and pass the CITI Chemistry Research Ethics course. A link to the instructions for the course appears on the MU online. The course will take a few hours to complete, so do not wait until the end to try it. Students must email me a .pdf copy of the completion certificate when you are done. In rare cases, students have been unable to download the certificate. In this event, take a screenshot and email it to me showing that you passed. This is 5% of the class grade.
2. Students will be given several written scenarios to read and consider. During the week of September 11th, we will meet in small groups with another faculty member. Students will be asked to describe how you would behave in such a scenario and then we will tell you what we would do. Ethics discussions require 2 hours, there will be several two-hour blocks for you to choose from, but each group is limited to four students.
3. In September, Students will write a paper discussing a scientific ethical problem. We will get together for a class period to discuss each article and go through the papers as a group. Two to three different scientific ethics problems will be discussed. Each student will be assigned a specific problem and write their ethics paper.
4. Your grade will be based on your use of English and the logic of the argument, not on whether the argument is "right" or "wrong."
5. **Ethics Paper Format:**
    a. The paper is to be at least 2 pages long and be double-spaced with 1-inch margins in either 12-point Times New Roman or 10-point Ariel font. There should be no extra spacing following paragraphs and should have only your name at the top of the paper. No more than 5 pages will be allowed for your discussion. This file must be submitted as a Word file and not as a PDF document.
    b. There are 3 primary actors discussed: the student, her/his advisor/mentor, and the 'university' (which comprises all persons of authority above the advisor as a group). You are to read the article and as much supplementary information as is necessary to decide who acted the least ethically in this series of events.
    c. In the paper, you are to explain why the actor you chose behaved most offensively, and to do that you must discuss why it is worse than the other two actors. Although it is your opinion, this is a formal paper, and you should not use personal pronouns. For details on how to write a formal opinion, you might read op-ed pieces in a major newspaper like the NY Times or Washington Post.
    d. The paper must have at least two references beyond the article (at least three references total). The reference list does not count toward the page count. If you assert things as true, they must either be in the article, or you must have a reference. This includes the sequence of events. That is, if you assert one thing causes a second, the chronology must be correct. Internet references are acceptable for this paper.
    e. Formatting of references should follow ACS Referencing Style 1 (as the Journal of American Chemical Society, JACS): https://pubs.acs.org/userimages/ContentEditor/1246030496632/chapter14.pdf.

In all cases, ethics discussions are confidential.

Research Proposal / Literature Review

This part of the course will have three components:

1. Students will use the MU online (Blackboard) course page to examine the profiles of faculty members to determine which projects might interest them as a Capstone project if you plan to do research. *If you plan to do an internship, select a project that seems interesting to you, but it **must** come from a chemistry department faculty member*.

Students should meet with 3 faculty members to discuss their research with them. You **must** talk and/or email with the person you select and get his or her e-signature or email on the Capstone advisor form (The capstone form can be found in MU online). *If you do not plan a research project and plan to do an internship, Students **must** choose a chemistry faculty member as a mentor, otherwise, there is no restriction*. There is a list of approved faculty to perform research in MU online.

Be sure the faculty member you select is willing to mentor you before listing them as your first choice. The faculty will be contacted to corroborate that they can work with you.

2. If the student is *already doing research with a mentor*, the student will select one project and write a short research proposal describing their proposed capstone project. The proposal must have at least 5 relevant references from the primary literature. The project may have a brief description of preliminary results, but most of the proposal must be about what you plan to do.
3. If the student *is not doing research*, your 1st choice of a mentor will give you suggestions on various topics and you will write a literature research paper. Review the current scientific literature (in journals, SciFinder, etc.); find 3-4 recent papers you are interested in investigating further. The topic you will select has to be like your future research. The research paper must demonstrate extensive use of the chemical literature. You may contact your future mentor for suggestions or feedback, but it is not required. Students doing the literature research paper are expected to work independently.
4. **Literature review formats:** The report will be written in standard ACS style (refer to papers published in the Journal of the American Chemical Society) and will include a brief abstract (4 – 5 sentences, less than 200 words), an introduction explaining the motivation and establishing the significance of the topic along with the objectives of the literature review, context in where the students can discuss the evidence of each article and provide analysis and comparison of the importance of each article to similar ones (why is the research relevant?), conclusions in where students will summarize their main findings, *make clear how this review of the literature supports (or not) the research to follow, and may point the direction for further research including characterization techniques and instrumentations you may use, acknowledgments, and references.* We will address the particulars of each section in class.
    a. It should be at least 5 pages, employing Times New Roman 12-point font or Arial 10-point font with 1" margins. It should be double-spaced with no extra space between paragraphs or section headers. Acknowledgments and references do not count toward the page total. You may include figures but use the 'wrap-around' function in your word processor to minimize the space it takes up. Formatting of references (ACS style 1 as *JACS*)should follow ACS Referencing Style 1 (as the Journal of American Chemical Society, JACS): https://pubs.acs.org/userimages/ContentEditor/1246030496632/chapter14.pdf.

More specific instructions about guidelines will be posted in MU online. All documents for the class must be submitted to MU online. Emails will not be accepted.

5. **Research proposal formats:** The report will be written in standard ACS style (refer to papers published in the Journal of the American Chemical Society) and will include:
    a. *Title* – Include the title of the project, your name, and the name of your capstone mentor. Do not include a cover letter on the first page.
    b. *Abstract* – A less than one-page synopsis of your major accomplishments. It may include some information (4 – 5 sentences, less than 200 words) about significance and experimental descriptions.

c. *Introduction* – This should provide a brief history of the area of research, its significance, problem, and hypothesis, and how your research objectives contribute to it. It should begin at the top of the page.
d. *Experimental Section* – This describes the experiments you will perform in much the same way a lab manual does. It should also include the equipment you will use. Include materials, procedures, and methods such as characterization techniques. Consult with your advisor to be sure whether or how to cite this information.
e. *Expected Outcomes* – This section will include a succinct description of the experiments and significance of the project you will perform and expectations. This section should include both mathematical and chemical equations where relevant. Include tables of data, figures, and spectra as relevant. All three should have labels. Include future goals of the project.
f. *Summary or Conclusion*- This section will include a summary of the project. Here, the student should address whether the semester goals have been met, future work, and what you learned this semester.
g. *Acknowledgments* – Acknowledge funding agencies and others that have assisted with the research. The acknowledgment section does not count toward the page total.
h. *References* – This should include literature citations. References do not count toward the page total. You may include figures but use the 'wrap-around' function in your word processor to minimize the space it takes up. Formatting of references (ACS style 1 as *JACS*) should follow ACS Referencing Style 1 (as the Journal of American Chemical Society, JACS): https://pubs.acs.org/userimages/ContentEditor/1246030496632/chapter14.pdf.

i. It should be at least 5 pages long not including references, employing Times New Roman 12-point font or Arial 10-point font with 1" margins. It should be double-spaced with no extra space between paragraphs or section headers. It should be double-spaced with no extra space between paragraphs or section headers. Acknowledgments and references do not count towards the page total. You may include figures but use the 'wrap-around' function in your word processor to minimize the space it takes up.
ii. Students must give a draft of the paper for your advisor to comment on at **least 3 business days prior *(November 14th)*** to the due date for the assignment. The advisor may ask for it earlier than this. The research paper must be reviewed and signed by your faculty mentor and will be read by a student in class before it is turned in for final grading. When you send the proposal to your mentor, send him/her the guidelines for the proposal. The faculty signature should be in the form of an email verifying that s/he has read at least one draft of the proposal/review and provided comments. Changes or comments for the Research paper formulated by the research mentor should be taken into consideration for the final Research proposal file which is submitted in MU online on December 4th.
Failure to provide an email will result in a one-letter grade reduction on the proposal/review.

6. During presentation week (**November 13th and 15th**), each student will listen to each student's presentation. Each student will submit a paragraph or two with comments and questions about every presenter's research. Each student should incorporate information from each student's peer review into your final paper (**due December 4th**) as well as your faculty's mentor changes/comments (*proposals*), if it is appropriate. This is a formal paper and should be written as such.
7. **Presentation of your paper:** At the end of the course, **all students in this course** will make an 8 to 10-minute *presentation on your proposed research or literature review paper.* It will be critiqued by two faculty members and the class. Occasionally, presentations require major changes. In those cases, students will have at least a week to make changes and must present them again. In that case, you will be informed of the date of your second opportunity. The presentation grade will be the average of your first and second trials of your presentation.

More specific instructions about guidelines will be posted in MU online. All documents for the class must be submitted to MU online. Emails will not be accepted.

Scientific Research Paper Presentation

All students in this course will be required to present an assigned research paper. The research paper will be assigned by your CHM 305 faculty mentor or CHM 305 instructor. Students will discuss the purpose of the work, the design

of the research project used and its operational principles, the data presented, and the conclusions reached. This research paper can be related to the student's research proposal/review, but it will not be the same presentation.

Note: *This is the first presentation student will do in class and it is not the same as your research paper you will write and present in class later in* ***November.***

Plan the presentation for about 5 to 6 minutes with 2 minutes for questions. This means about 10 slides. The presentation should be organized as follows:

1. Describe the chemical problem, why the analysis is needed, and the motivation for the work,
2. Present details of the measurement method (how everything is fit together and how it works)
3. Present and discuss the measurements made and the data presented
4. Review the conclusions from the paper and
5. Offer your perspectives about what the future holds for the measurement method and what chemical or biochemical problems it could be used to help solve.

As you read through the paper, it may be necessary for you to obtain other literature to understand and explain the work presented. Also, note that when you find the article on the journal website, there is very often supplemental information that you should access and use in your presentation. At the end of your presentation, list the citations you used. All students will submit the PowerPoint presentation in MU online on **Monday, October 23rd by 11:30 am.**

Laboratory Notebooks and Time management

There will be one class meeting to discuss the proper construction of a laboratory notebook and improve time management for classes and research.

Literature Search

On one or two occasions we will get together to discuss various types of literature references that you may have to make use of during your careers. These include (at a minimum) *Chemical Abstracts*, *PubMed, Beilstein*, the "Comprehensive," "Advances in," "Progress in," and "Dictionary of" book series, and the *Kirk-Othmer Encyclopedia of Chemical Technology*. There will also be a demonstration of the online *Science Citation Index*. These books and book series constitute major review sources of information which can be very difficult to track down through the primary literature. We will discuss how to read a scientific paper in one of these meetings.

Tentative Course Schedule

Dates	Guide
Wednesday, Aug. 23	Introduction – How to pick a research advisor and topic. Send Doodle survey
Wednesday, Aug. 30	How to use SciFinder® and PubMed® & sources and kinds of literature. *Librarian will visit the class*
Wednesday, Sept. 6	A Brief History of Ethics
Sept. 11, 13, and 15	Ethics vignettes discussed all week (3-4 students per session)
Wednesday, Sept. 20	How to write a laboratory notebook and research paper: figures and tables. ACS reference style 1.
Sept. 25, 27, and 29	Discussion of issues raised in ethics paper (1/3 of class each day)
Wednesday, Oct. 4	Introduction to Research: Expectations, mentor, capstone experience, presentations Time management
Wednesday, Oct. 11	Making a professional presentation and a poster
Wednesday, Oct. 18	*
Oct. 23, 25, and 27	Presenting your assigned scientific publication
Wednesday, Nov. 1	Feedback and major comments about the presentations. Questions about the research paper
Wednesday, Nov. 8	*
Nov. 13, 15, and 17	Research proposals/reviews were presented all week and peer-reviewed paragraph
Friday, November 17	*Last day to withdraw from an individual full-semester course*
Wednesday, Nov. 22	THANKSGIVING BREAK
Wednesday, Nov. 29	Makeup presentation of your Research Proposal/ Review

*There is no class meeting on these days under normal circumstances. Should the campus be closed on the date of a class meeting, these days will be used in place of the missed day.

**** This schedule is subject to change. Changes, if necessary, will be announced in class****

University Policies

(QM Standard 1.4) By enrolling in this course, you agree to the University Policies. Please read the full text of each policy (listed below) by going to MU Academic Affairs: University Policies. (URL: http://www.marshall.edu/academic-affairs/policies/)

- Academic Dishonesty Policy
- Academic Dismissal Policy
- Academic Forgiveness Policy
- Academic Probation and Suspension Policy
- Affirmative Action Policy
- Dead Week Policy
- D/F Repeat Rule
- Excused Absence Policy for Undergraduates
- Inclement Weather Policy

- Sexual Harassment Policy – Title IX prohibits the harassment of students based on sex, which includes pregnancy, childbirth, and related conditions. This includes that students will not be penalized for taking medically necessary leave related to pregnancy, childbirth, or related conditions. Marshall's Title IX Office may be contacted at TitleIX@marshall.edu
- Students with Disabilities (Policies and Procedures)
- University Computing Services Acceptable Use Policy

Students with Disabilities

(QM Standard 7.2) For University policies and the procedures for obtaining services, please go to MU Academic Affairs: University Policies and read the section, **Students with Disabilities**. (URL: http://www.marshall.edu/academic-affairs/policies/)

Additional Policies:

I have an Open Communication Policy: If you are having any questions class related, please do not hesitate to email me or call my office.

Three of the assignments for this class require you to be present and cannot be replicated because they involve group participation. Even with an excused absence, your grade will be reduced by a letter grade if you cannot make alternative arrangements with me by the first 24 hours occurring after the student is permitted to return to campus.

The papers are due on the date indicated in the syllabus. The papers cannot be made up unless the student presents a university-approved excuse to the instructor within the first 24 hours occurring after the student is permitted to return to campus. Likewise, if an assignment falls on a day that is canceled by the university (e.g., a snow day), it should be turned in on time.

Plagiarism Statement (Academic Affairs Policy): Plagiarism is submitting as one's own work or creation of any material or an idea wholly or in part created by another. This includes:

- Oral, written, and graphical material.
- Both published and unpublished work.

It is the student's responsibility to clearly distinguish his/her own work from that created by others. This includes the proper use of quotation marks, paraphrasing, and the citation of the original source. Students are responsible for both intentional and unintentional acts of plagiarism.

Sanction: Sanctions for academic dishonesty may be imposed by the instructor of the course. The sanction for academic dishonesty may be imposed even if a student withdraws from an individual course or from the university entirely. The instructor may impose the following sanctions:

- A lower or failing project/paper/test grade
- A lower final grade
- Failure of the course
- Exclusion from further participation in the class (including laboratories or clinical experiences).

Artificial Intelligence (AI) Policy

Generative AI is permitted/encouraged with proper attribution, but prohibited in other ways.

Students are allowed, and even encouraged, to use Generative AI in some ways but are prohibited from using it in other ways. Keep in mind that any content produced by generative AI can "hallucinate" (produce false information), so students are responsible for ensuring the accuracy of any AI-generated content. For information on citing AI, please see MU Library's citation website (URL: https://libguides.marshall.edu/plagiarism-AI/cite). Students should not use generative AI in any way that would violate the Student Code of Conduct (URL: https://www.marshall.edu/student-conduct/files/Studnet-Code-of-Conduct-2022.pdf).

Students are permitted and encouraged to use generative AI in the following ways:

Brainstorming: You may use generative AI to stimulate creativity, generate ideas, or brainstorm topics for papers, presentations, and discussions. The generated content must serve as a stepping stone, not a final product.

Citation Assistance: AI tools can be used to manage, format, and organize citations and references, promoting adherence to academic writing standards and specific style guides required for individual assignments.

Grammar and Style Checking: AI-powered writing enhancement tools may be used to help with spelling, grammar, syntax, and stylistic errors.

Concept Understanding: Generative AI can be used to explain or simulate concepts taught in class, aiding in a deeper understanding.

Research Assistance: AI can be used to conduct initial research, compile data, and summarize articles, books, or papers. It should not replace traditional research methods but rather enhance them.

You may not use generative AI in coursework in the following ways:

Plagiarism: Using AI-generated content as your original work without attribution. This includes essays, papers, presentations, and exam answers.

Data Manipulation: Using AI tools to alter data or create misleading information.

Misrepresentation of Skills: Using generative AI to complete tasks that are meant to assess your knowledge and skills.

Confidentiality Breach: Using AI tools that might violate university policies or laws related to data privacy and confidentiality.

See individual assignment instructions for more details.

Metacognitive Reflection. In addition to a proper citation, the student should include the following statement with any assignment where generative AI is used for assistance.

"I used generative AI platform [INSERT NAME OF PLATFORM, SUCH AS CHAT GPT] for assistance in the following ways on this assignment: [INSERT WAYS USED, such as brainstorming, citation assistance, grammar and style checking, concept understanding, and research assistance, etc.]."