

CHM4411L: Physical Chemistry Lab, Fall 2020

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Course Description

Chemistry is a laboratory science. Most advancements and new discoveries in chemistry are made through careful laboratory research following the scientific method. Understanding how to work efficiently and methodically in the laboratory environment is a critical skill that comes from training and experience. Exciting discoveries and breakthroughs are much more likely to be made by a well-trained researcher who carefully records their measurements and observations, uses the instrumentation properly, and deeply understands the theoretical principles of the experiment. All measurements are susceptible to systematic or random errors, and the estimation of these uncertainties can be just as important as the value of the measurement itself. Effective communication of laboratory results through publications and presentations plays a major role in the advancement of science. In this course, scientific writing and presentation skills will be cultivated, and student development in these areas is expected.

Course Objectives

By the end of this course, you will be able to:

1. Create high-quality scientific reports with a format similar to a Journal Publication
2. Analyze and present experimental data graphically, cogently, and succinctly.
3. Keep a professional scientific notebook.
4. Perform reliable and accurate measurements.
5. Interpret and expand scientific protocols and experimental design.
6. Give a professional presentation on scientific work performed in the lab.
Properly estimate the uncertainty in measured quantities and report numerical quantities in an appropriate format.

UF COVID-19 Statements

1) Our class sessions may be audio-visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate verbally are agreeing to have their voices recorded.

If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared.

As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

2) We will have face-to-face instructional sessions to accomplish the student learning objectives of this course. In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions.

- You are required to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution.
- This course has been assigned a physical classroom with enough capacity to maintain physical distancing (6 feet between individuals) requirements. Please utilize designated seats and maintain appropriate spacing between students. Please do not move desks or stations.
- Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.
- Follow your instructor's guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom.
- If you are experiencing COVID-19 symptoms ([Click here for guidance from the CDC on symptoms of coronavirus \(Links to an external site.\)](#)), please use the UF Health screening system and follow the instructions on whether you are able to attend class. [Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms \(Links to an external site.\)](#).
- 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. [Find more information in the university attendance policies \(Links to an external site.\)](#).

Impacts on this Courses

Laboratory training is inherently a hands-on activity and the learning objectives cannot be realized by a curriculum translated to an on-line format. The experiments require students to be working with specialized instrumentation and receiving instructions and assistance from instructors and TA's in the same room. There has been much recent debate about the prudence of holding in-person teaching activities. The University sets the policies, not the instructors and TA's. They will do their best to respond to the needs of the students while providing the best possible conditions for learning under the current conditions to fulfill UF's mission. Working with administration, the instructors have developed plans and policies intended to minimize the risks. The conduct of students, instructors and TA's in this class are bound by the UF COVID-19 Statements, provided above.

As a necessary adjustment to the curriculum, there will be fewer laboratory experiments compared to normal. To compensate, there will be a greater focus on quality, depth, scientific writing, treatment of errors, oral presentation skills, and software training. To adequately separate students in the lab, labs will run at half the normal occupancy of 12 students. Six students will be present in the lab, each working individually on a separate experimental setup.

Each student will be assigned to a group and an arrival code.

Arrival code:

A = arrive at the lab at 12:50

B = arrive at the lab at 3:00

The following procedures will be in effect:

- N95 or KN95 masks will always be worn. Any infraction of this policy will not be tolerated. See the UF COVID-19 Statement below. Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.
- Hand-washing stations and hand sanitizer will be provided in the labs and should be frequently used.
- When the experiments are completed and before students leave, students are responsible for wiping down their work areas including any equipment or instrumentation that was used with appropriate disinfectants provided by the Department of Chemistry under the supervision of the instructor or TAs. The instructor and TA's are not responsible for sanitizing the work areas.
- Follow your instructor's guidance on how to enter and exit the classroom, and practice physical distancing to the extent possible when entering and exiting the classroom.
- UF-approved scientific safety glasses or goggles must be worn at all times in the lab. Entering the lab or removing the safety equipment at any time will not be tolerated.

Most importantly, if you are experiencing COVID-19 symptoms ([Click here for guidance from the CDC on symptoms of coronavirus \(Links to an external site.\)](#)), please use the UF Health screening system and follow the instructions on whether you are able to attend class. [Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms \(Links to an external site.\)](#).

General Information

Meeting times

The lectures will be presented on Zoom each Tuesday at 8:30 am (period 2).

Labs meet Tuesday (section 11416) and Wednesday (section 11417) periods 6-10 (12:50-6:00).

If you're going to miss any lecture or lab for any reason, please let the instructor know in advance. Don't be late to lab. We keep tabs on that. If you're more than 1/2 hour late, we may not be able to let you in.

Office Hours

Name	Room	Time
Russ Bowers	Zoom	Monday 12:50 - 1:40
	Zoom	Friday 1:00 - 2:00
TBA	Zoom	TBA
TBA	Zoom	

Grading

Your grade will be derived from the weighted average of performances in each component:

Quizzes	15%
Notebook	15%
Reports (written and oral)	60%
Demeanor, professionalism, and adherence to chemical hygiene and safety policies	10%
Total	100%

Your course grade will be determined from your total course performance percentage as follows:

The following grading standards will be used in this class:

Grade	Range
A	100 % to 94.0%
A-	< 94.0 % to 90.0%
B+	< 90.0 % to 87.0%
B	< 87.0 % to 84.0%
B-	< 84.0 % to 80.0%
C+	< 80.0 % to 77.0%
C	< 77.0 % to 74.0%
C-	< 74.0 % to 70.0%
D+	< 70.0 % to 67.0%
D	< 67.0 % to 64.0%
D-	< 64.0 % to 61.0%
F	< 61.0 % to 0.0%

All grades will be posted in the Canvas GradeBook, as available. UF's Grading Policy:
<http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>

Safety

All safety procedures must be strictly obeyed.

N95 or KN95 masks must be worn at all times. Failure to comply will result in ejection from the lab. There will be no warnings.

UF Approved eye protection (safety glasses or goggles) must be worn at all times in the laboratory. Do not enter the lab without eye protection. Violators will be asked to leave and there will be no warnings.

Wear long-sleeved and long-legged clothes to protect your skin against spills, or bring an approved lab lab coat. Closed-toed shoes are mandatory. Remove all pendant jewelry when working in the lab. If you have long hair, you may not let it hang loose but should tuck it away safely so that it doesn't present a potential hazard for you. Refer to the ACS safety manual (click on the link or find under Files → Resources on Canvas) which regulates all safety procedures in the lab.

Scientific Writing Guide

The Scientist's Guide to Writing: How to Write More Easily and Effectively throughout Your Scientific Career, by Stephen B. Heard (Author). ISBN: 978-0691170220, published 2016. Available in paperback in the UF Bookstore or [Amazon](#), as an Amazon Kindle E-book, or on course reserve at the Marston Science Library.

Required Software

MagicPlot Pro - professional plotting and analysis software. An annual license is available with a special price \$19 (USD) for university students. Contact MagicPlot (<https://magicplot.com/contacts.php>) using your UF e-mail address to request instructions on how to complete the order. Note: This is a full-functional license for the Pro edition, not to be confused with MagicPlot Student edition which is a limited-function version and free of charge.

PDF Scan Software - for scanning your notebook pages into PDF for uploading onto Canvas. [Genius Scan](#), by Grizzly Labs, is highly recommended. The app is available for IOS or Android phones. PDF scans can be directly uploaded to Cloud Storage such as UF Google Drive, Dropbox, or UF OneDrive.

Spreadsheet software - Microsoft Excel or Google Sheets. For manual data logging and data manipulation, and quick plots of raw data. For reports, better quality plots can be generated using Magic Plot (see above).

Word Processing - The standard is MS Word with the built-in equation editor. Any other word-processing software with equation editing capability is also acceptable. Fancier equation formatting can be achieved using the [MathType](#) plugin from Design Science is optional.

UFApps - UFApps offers a large number of different software packages to UF students free of charge. We will be using Mathematica and Matlab in CHM4411L, which are available on UFApps.

UF OneDrive - required for transferring files between your local computer and UFApps.

Lab Notebook

Every good Chemist has a lab notebook by their side. It is a journal, evidence of discovery, a historical record, and a valuable tool. You will keep a proper lab notebook in this course. Your notebook will be checked and graded at the beginning and end of each lab period. Proper notebook format and note-taking is described in the module.

Prior to the experiment:

- Every *individual's* notebook needs to be prepared with all tables and notes necessary for the specific experiment prior to coming to lab. This will be uploaded to Canvas prior to the lab session and will determine your Notebook Grade (see grade computation below).

- Every **group** should come with a laptop that has sufficient software to plot data as you collect it. The specific software should be prepared before coming to lab.

During the experiment:

- Your group should assess your data as it is collected, either visually with a plot, or by forming a table, or both.
- It is your responsibility to repeat data measurements in cases where things have gone awry.
- After the lab session:
- Make a PDF scan of your notebook and upload the assignment in the module before leaving the lab. There will be a 10% grade deduction for late uploads the same day as the lab meeting and an additional 10% automatic deduction for each subsequent late day.

Lab Reports

Each student will be responsible for submitting a write-up after each experiment. The specific expectations and due dates will be stated on the assignment page for each experiment. Many of the assignments will require you to write one or more of the sections described below.

Reports should be typeset in a word processing program (e.g. MS Word). Equations should be typeset using the MS word equation editor or MathType. Typos, misspellings, and improper grammar will reduce your grade. Avoid use of colloquial language. Pay attention to your word choice and always strive to find the word that fits most precisely to what you want to say or describe. Go back over your writing as many times as needed to polish it up and organize the content in the most effective way.

Whenever possible, use mathematical, spreadsheet and/or graphing software for your analysis, such as MagicPlot, Mathematica, Matlab, Excel, *etc.* Formatting considerations for plots and diagrams are discussed in the module. The default setting of MS Excel is particularly notorious in producing awful plots. If you decide to work with Excel, make sure to modify the settings to conform to the required format.

Full Report Format

1. Title Page
2. Abstract (300-400 words)
3. Introduction: State the purpose and/or problem on which the experiment is focused. Briefly indicate the theory or hypothesis to be verified.
4. Methods: Briefly describe the procedure used. It may be appropriate to include an illustration or a block diagram of the experimental set-up.
5. Include the molecular structures of any chemical compounds or materials used in the experiment (excluding solvents etc.), and provide schemes of any reactions that take place.
6. Theory. Any equations used in the derivation of values of interest using measured values, including example calculations.
7. Results
 - Summary of results presented in tables and/ or figures
 - Any equations used in the analysis of the collected data, including example calculations
 - Error analysis. Provide example calculations and formulas for propagation of error
8. Discussion. Based on your experimental results evaluate your data in terms of the applicable theory, and try to answer the question/ hypothesis presented in the introduction. Determine whether your results corroborate or disprove the working theory/hypothesis. Suggest reasons for

such disagreements and try to analyze them as much as possible. If your results fit within the accepted theory, discuss to what extent (to which experimental precision) this is the case. Discuss strengths and weaknesses of the approach. Discuss what improvements could be done to the experimental approach and/or the theory.

9. Conclusion. Summarize the most important conclusions arising out of the Discussion section, provide important measurement results with proper error limits, and state how your work fits into the bigger scheme of things (as outlined in the introduction).
10. References – References should follow ACS formatting guidelines. See the module.

Late Submission Policy

Late assignments will receive a late penalty of 10% per day past the scheduled due date. If something arises that prevents you from completing the assignment on time, contact the instructor as soon as possible to request an extension.

Resubmission Policy

If you are unhappy with the grade of a written report (excluding the last written report of the semester), you may resubmit it with corrections. Each assignment can be resubmitted once. The resubmission must be turned in no more than one week after the original grade is posted to Canvas. The maximum score you will be able to receive is 80% (B-). Resubmissions will only be considered if there is sufficient time left in the semester.

Getting Help

For the quickest response, you might find it useful to post questions to the Canvas Discussion Board. Messaging the Instructor, TA, or even a classmate also works.

For Username/Password issues, such as difficulties logging into any Gatorlink-authenticated site at UF, (including our course website), please contact the UF Help Desk at: helpdesk@ufl.edu, (352) 392-HELP - select option 2.

UF Policies Shaping This Course

This course is aligned with the UF policies below.

- Contact Hours: "Contact Hours" refers to the hours per week in which students are in contact with the instructor, excluding office hours or other voluntary contact. The number of contact hours in this course equals the number of credits the course offers.
- Workload: As a Carnegie I, research-intensive university, UF is required by federal law to assign at least 2 hours of work outside of class for every contact hour. Work done in these hours may include reading/viewing assigned material and doing explicitly assigned individual or group work, as well as reviewing notes from class, synthesizing information in advance of exams or papers, and other self-determined study tasks.
- Accommodation for Student with Disabilities: Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. This class supports the needs of different learners; it is important for students to share their accommodation letter with their instructor and discuss their access needs as early as possible in the semester.

- Statement Regarding 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 from [the Gatorevals website](#). 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 [the evaluation system](#). Summaries of course evaluation results are available to students at the [public results website](#).
- Statement Regarding Course Recording: Our class sessions may be audio visually recorded for students in the class to refer back to and for use of enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate verbally are agreeing to have their voices recorded. If you are unwilling to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

University Policy on Academic Misconduct

This class will operate under the policies of the student honor code which can be found at: <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>. The students, instructor, and TAs are honor-bound to comply with the Honors Pledge: **We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.** You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."* It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks. Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>.

Additional UF Policies and Resources

University Police

[The UF police are together for a safe campus. 392-1111 \(or 9-1-1 for emergencies\)](#)
<http://www.police.ufl.edu/>.

Career Connections Center

[Career Connections Center](#) (352-392-1601 | CareerCenterMarketing@ufsa.ufl.edu) connects job seekers with employers and offers guidance to enrich your collegiate experience and prepare you for life after graduation.

Counseling and Wellness Center

[Counseling and Wellness Center](#)(352-392-1575) provides counseling and support as well as crisis and wellness services including a [variety of workshops](#) throughout the semester (e.g., Yappy Hour, Relaxation and Resilience).

Dean of Students Office

[Dean of Students Office](#)(352-392-1261) provides a variety of services to students and families, including [Field and Fork](#)(UF's food pantry) and [New Student and Family programs](#)

Disability Resource Center

- [Disability Resource Center](#)(DRCAccessUF@ufsa.ufl.edu | 352-392-8565) helps to provide an accessible learning environment for all by providing support services and facilitating accommodations, which may vary from course to course. Once registered with DRC, students will receive an accommodation letter that must be presented to the instructor when requesting accommodations. Students should follow this procedure as early as possible in the semester.

Multicultural and Diversity Affairs

[Multicultural and Diversity Affairs](#)(352-294-7850) celebrates and empowers diverse communities and advocates for an inclusive campus.

Office of Student Veteran Services

[Office of Student Veteran Services](#)(352-294-2948 | vacounselor@ufl.edu) assists student military veterans with access to benefits.

ONE.UF

[ONE.UF](#) is the home of all the student self-service applications, including access to:

- [Advising](#)
- [Bursar](#)(352-392-0181)
- [Financial Aid](#)(352-392-1275)
- [Registrar](#)(352-392-1374)

Official Sources of Rules and Regulations

The official source of rules and regulations for UF students is the [Undergraduate Catalog](#) and [Graduate Catalog](#). Quick links to other information have also been provided below.

- [Student Handbook](#)
- [Student Responsibilities](#), including academic honesty and student conduct code
- [e-Learning Supported Services Policies](#) includes links to relevant policies including Acceptable Use, Privacy, and many more
- [Accessibility](#), including the Electronic Information Technology Accessibility Policy and ADA Compliance
- [Student Computing Requirements](#), including minimum and recommended technology requirements and competencies.

DISCLAIMER

All aspects of course operations, including grading, course policy, and policy execution, are subject to change at the discretion of the course instructor without notice.

Activity Schedule (subject to change)

Due to the COVID-19 social distancing policy, students will work on experiments individually. Each section will be divided into 6 groups of two students. Students will be assigned a group # and an arrival code. Arrival code A students will report to the lab at 12:50 pm, and code B students at 3:00 pm.

Week	Date	GROUP #					
		1	2	3	4	5	6
1	Aug 31	NO LAB					
2	Sept 7	Library Training/Zoom					
3	14	Introduction to NMR/Zoom/VNC					
4	21	Scientific Writing/Zoom					
5	28	NMR - Molecule Structure of Angiotensin-II/Zoom					
6	Oct 5	EPR	FTIR	Heat cap 1	Heat cap 2	Dyes	Iodine
7	12	FTIR	Dyes	Heat cap 2	Heat cap 1	Iodine	EPR
8	19	Heat cap 1	Heat cap 2	Dyes	Iodine	EPR	FTIR
9	26	Heat cap 2	Heat cap 1	Iodine	EPR	FTIR	Dyes
10	Nov. 2	Dyes	Iodine	EPR	FTIR	Heat cap 1	Heat cap 2
11	9	Iodine	EPR	FTIR	Dyes	Heat cap 2	Heat cap 1
12	16	MAKE UP/CATCH UP WEEK					
13	23	HAPPY THANKSGIVING – NO LAB OR LECTURE					
14	30	INDEPENDENT RESEARCH PROJECT – RESEARCH PROPOSAL					
15	Dec 7	DEVELOPMENT					

Lab reports are due two weeks after completion with the exception of the heat capacity lab report, which is due one week after completion of the 2nd part of that lab.