

Course Information

Chem. 4473.001

Physical Measurement Laboratory

Fall 2016

Professor Contact Information

Professor: Jie Zheng
Meetings: Lecture: SLC 2.203; Lab: BE 2.330
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Course Pre-requisites, Co-requisites, and/or Other Restrictions

Prerequisite: CHEM 2401 Quantitative Analysis, ChEM 3472, Instrumental Analysis and CHEM 3321. No students will be allowed to remain in the course without passing these prerequisites as basic knowledge of data handling and instrumentation is essential for successful completion of the course. It is also strongly suggested that you be enrolled in or have taken CHEM 3322

Course Description

The goal of this course is to help students gain better understanding of physical chemistry principles through hand-on experiences and help students be well prepared for future independent research. Key physical chemistry principles will be discussed in the details. Eight lab modules and related lectures with emphasis on the underlined principles of quantum mechanics and classical mechanics are designed. Students will also gain training for research design, data analysis, report writing and research presentation, so that they can be prepared for future independent research career.

Student Learning Objectives/Outcomes

Deep Understanding of fundamental physical chemical principles through hand-on experiences.

Critical Thinking (CT)—to include how to use the physical chemistry to conduct creative thinking, innovation, inquiry, and analysis, evaluation, and synthesis of information

Communication (COM)—to include effective development, interpretation, and expression of ideas through written, oral, and visual communication

Empirical and Quantitative Skills (EQS)—to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions

Teamwork (TW)—to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal

Required Textbooks and Materials

Experiments in Physical Chemistry”, by C.W. Garland, J.W. Nibler, D.P. Shoemaker, McGraw-Hill, 8th edition, ISBN 978-0-07-282842-9. Lab Book: “Roaring Springs Composition Book”, Quad. Rules 5 to 1”, Bar Code 71072 77255, available in UTD Bookstore (required) Z-87 Safety Eye Protection are required. Other course materials will be given as handouts.

Suggested Course Materials

Assignments & Academic Calendar

LECTURE, LABORATORY, AND EXAM SCHEDULE

(The dates, order of presentation and topical coverage are subject to change. The correspondence between the material covered and the chapters in the text is approximate.)

There are no dates for make up labs.

	<u>Date</u>	<u>Lecture Topic</u>
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M.	08/22	Class Organization, course overview
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W	08/24	In-class Test on Instrumental Analysis and Physical Chemistry I
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M	08/29	Data Analysis and Statistics (I)
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- W. 08/31 Data Analysis and Lab Policy
- M. 09/5 Labor Day
- W 09/7 Understanding properties of the light: Wave property (I)
- M. 09/12 Understand “a particle in a box” model”: conjugation polymer & surface plasmons
- W 09/14 Absorption spectroscopy Lab
- M. 09/19 Quantum dots: “What “size dependent” and “size-independent” mean (I)
- W 09/21 Fluorescence spectroscopy Lab: “ Nano rainbow”
- M. 09/26 **Midterm 1**
- W 09/28 **Exam review 1**
- M. 10/03 Understanding fine structure of a molecule: Vibrational-Rotational (I)
- W. 10/05 Vibrational-Rotational Spectroscopy Lab
- M. 10/10 Understanding properties of the light: CD spectroscopy(II)
- W 10/12 CD spectroscopy lab: “CD Method for Heat Capacity Determination in Proteins”
- M. 10/17 Chemical Kinetics: “Understand reaction order” (I)
- W. 10/19 Chemical Kinetics Lab
- M. 10/24 **Midterm 2**
- W. 10/26 **Midterm review 2**
- M. 10/31 Laws of thermodynamics
- W. 11/02 Heat of Combustion Lab: Bomb Calorimetry
- M. 11/07 Viscosity
- W 11/09 Viscosity lab
- M. 11/14 Brownian motion: Dynamics light scattering

- W. 11/16 Dynamics light scattering lab
- M. 11/21 Thanksgiving break
- W. 11/23 Thanksgiving break
- M. 11/28 Presentation and question answering
- W. 11/30 Presentation and question answering
- M. 12/05 Presentation and question answering
- W. 12/07 Final Review

Final Exam: To be determined

Lab/Alternate Activity Schedules

Students will work in groups. 8 lab modules will be available; Please see the detailed lab schedules.

Lab Modules

- L1 Absorption (conjugation dyes)
- L2 Fluorescence (Qdots)
- L3 Vibrational-rotational (HCl and DCL)
- L4 CD spectrometry
- L5 Chemical Kinetics (Kinetics of methylene blue reduction by ascorbic acid)
- L6 Bomb Calorimetry
- L7 Viscosity
- L8 Dynamic light scattering

Lab/Alternate Activity Schedule

(Assignments for Lab schedule will be made approximately one week prior to the start of labs.)

Date	Activity
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Date	1	2	3	4	5	6	7	8
9/19/16	L1							
9/21/16	L1							
9/26/16	L2							
9/28/16	L2							
10/3/16	L3							
10/5/16	L3							
10/10/16	L4							
10/12/16	L4							
10/17/16								
10/19/16								
10/23/16	L5							
10/25/16	L5							
10/31/16	L6							
11/02/16	L6							
11/07/16	L7							
11/09/16	L7							
11/14/16	L8							
11/16/16	L8							

Labs:

M-W: 9:15-11:45am; Room: BE 2.330

You are expected to record all data in your notebooks.

Lab safety: IMPORTANT: In accordance with University and Chemistry Department safety rules, any time anyone (student, TA, instructor, or visitor) is in a lab, Z87-rated safety eyewear must be worn. The first violation in the semester will result in a warning and removal from the lab until the safety eyewear is in-place. The second violation in the semester will result in dismissal from that lab period with no extra time being allowed for make-up of the work scheduled for that lab period. Similar penalties will apply if any other safety rules are violated. Please visit

<http://www.utdallas.edu/chemistry/resources/safety.html> for detailed safety rules.

Grading Policy

Your course grade will be determined as follows:

Lab (Prelab report 20% + lab report 20%); Research Presentation (10%), two mid-term exams (each 10%) and one final Exam (30%).

Reports:

Pre lab report: Students need to clearly define their research goal in each prelab report. The research goal is expected to address questions asked in each lab module. **Students need to come up with very detailed experimental plan and give rationale behind the plan.** TAs will grade the prelab reports based on whether the proposed experimental design can lead to the success of the research. Team work and literature research are encouraged, but students must write the prelab and final lab reports in their own words. The duplicated reports will lead to the failure of the whole lab module.

Prelab reports need to be turned in one week in the class before the labs start (Monday class). TA will grade and return the pre lab report in two days (Wednesday class).

Lab Reports:

Each student will collect data with a laboratory partner.

Each student will complete their own Lab Report for all **8 experiments** based on the guidelines given in the lecture. The laboratory reports must contain own graphs, own calculations, and own answers to assigned questions. All ten experiments will count towards your grade. Data sheets need to be attached to the final lab report. **An electronic copy should be turned in to the Turnitin box in eLearning.**

Students will directly turn in their lab reports to the TA before Monday labs start. The report and lab book should be graded over the weekend and returned to you on the following Monday.

No emailed submissions. NOTE: All lab reports received after the deadline will be penalized at a deduction rate of 5%. Each additional business day a lab report is late will be penalized at an additional deduction rate of 10% per day. Lab reports submitted later than 2 weeks after due date equal a zero (0).

If a student does not perform an Experiment, the student will receive zero points for the corresponding Lab Report. **NO** Make-up of lab periods/experiments.

- **If you wish to submit an exam or lab report for a re-grade because you believe you lost points unfairly, you must do so within the next class meeting of receiving your quiz, exam, or lab report.**
- **Your entire exam and/or lab report will be re-graded, not just the particular problem you pointed out.**

Lab grading policy.

Students are expected to turn in their lab reports before the deadlines. Five points/day will be deducted from the lab report after the deadline. They will receive zero on that lab module if the report was late more than two weeks after deadlines. If students have any

questions regarding their lab grades, they should discuss with TAs within one week after they receive the grades. After that, the lab grades will be finalized.

Lab/Alternate Activity Schedule

(Assignments for Lab schedule will be made approximately one week prior to the start of labs.)

Final letter grade will be assigned based on the following scale: A(100-90), B+(89-85), B(84-80), C+(79-75), C(74-70), D+(69-65), D(64-60), F(59-0).

Please note: Adjustments may be made by the instructor based on class ability.

Course & Instructor Policies

(Appendix B: Tentative lecture, laboratory and exam schedule:

(The dates, order of presentation and topical coverage are subject to change. The correspondence between the material covered and the chapters in the text is approximate.)

Appendix A: Course policies

Course Policies

Make-up Exams	None; points are rolled forward to next exam
Extra Credit	None
Late Work	Accepted at the sole discretion of the instructor
Special Assignments	None; syllabus is complete
Class Attendance	Used in determination of whether mercy is justified
Classroom Citizenship	Highest level is expected
Field Trip Policies	No off campus trips
Student Conduct and Discipline	The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, <i>A to Z Guide</i>, which is provided to all registered students each academic year. The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the <i>Rules and Regulations</i>,

	<i>Board of Regents, The University of Texas System, Part I, Chapter VI, Section 3, and in Title V, Rules on Student Services and Activities of the university's Handbook of Operating Procedures.</i> Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391). A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.
Academic Integrity	The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work. Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings. Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.
Email Use	The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with

	university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.
Withdrawal from Class	The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.
Student Grievance Procedures	Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's <i>Handbook of Operating Procedures</i>. In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the dean will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.
Incomplete Grades	As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of

	<u>F.</u>
Disability Services	The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m. The contact information for the Office of Disability Services is: The University of Texas at Dallas, SU 22 PO Box 830688 Richardson, Texas 75083-0688 (972) 883-2108 (voice or TTY) Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance. It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.
Religious Holy Days	The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated. The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one

	week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment. If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.
Off-Campus Instruction and Course Activities	Off-campus, out-of-state, and foreign instruction and activities are subject to state law and University policies and procedures regarding travel and risk-related activities. Information regarding these rules and regulations may be found at http://www.utdallas.edu/BusinessAffairs/Travel_Risk_Activities.htm. Additional information is available from the office of the school dean.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

“As a Comet, I pledge honesty, integrity, and service in all that I do.”

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University’s policies and procedures segment of the course syllabus.

Please go to <http://go.utdallas.edu/syllabus-policies> for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.