

COLLEGE OF LIBERAL ARTS AND SCIENCES, UIC
Chem 240, "Math in Physical Chemistry", 2 credit hours

I. Instructor & Course Details

Preston T. Snee

Email address: sneep@uic.edu

Office Hours: 10-11 Tu, Th, in SES Rm. 4176

Blackboard Course Site [LINK](#)

Students are expected to log into the course site regularly to learn about any developments related to the course, upload assignments, and communicate with classmates. For all technical questions about Blackboard, email the Learning Technology Solutions team at LTS@uic.edu.

II. Course Information

Course Description and Prerequisite Statement

What is Mathematical Methods in Physical Chemistry? For this class we will augment your knowledge of mathematics to match that of the most well-prepared graduate student in the physical sciences.

Course Goals and Learning Objectives

Goals and Competencies Gained, Learning Objectives, and General Education Learning Objectives:

- 1) Review some of your high school calculus.
- 2) Discuss more advanced material with regards to topics covered in Physical Chemistry 1&2 including the associated lab:
 - Statistics and distributions
 - Differential equations
 - Use of computational tools for mathematics
 - Advanced data fitting and error analyses

Required and Recommended Course Materials

- The textbook, "Mathematics for Physical Chemistry", by Donald A. McQuarrie
- Download a copy of Mathematica from the UIC Webstore
- Download a copy of Matlab from the UIC Webstore

Respect for Copyright

Please protect the copyright integrity of all course materials and content. Please do not upload course materials not created by you onto third-party websites or share content with anyone not enrolled in our course.

III. COURSE POLICIES & CLASSROOM EXPECTATIONS

Grading Policy and Point Breakdown

Problem sets: 100 points

Hour exams: 200 points

Final: 200 points

Policy for Missed or Late Work

Exams and homeworks cannot be submitted late without the permission of the instructor.

Attendance / Participation Policy

Policy: Please email me if you face an unexpected situation that may impede your attendance, participation in required class and exam sessions, or timely completion of assignments.

Other Course Policies

Academic Integrity

As a student and member of the UIC community, you are expected to adhere to the Community Standards of academic integrity, accountability, and respect. Please review the UIC Student Disciplinary Policy for additional information.

Email Expectations

Students are responsible for all information instructors send to your UIC email and Blackboard accounts. Faculty messages should be regularly monitored and read in a timely fashion.

IV. ACCOMMODATIONS

Disability Accommodation Procedures

UIC is committed to full inclusion and participation of people with disabilities in all aspects of university life. If you face or anticipate disability-related barriers while at UIC, please connect with the Disability Resource Center (DRC) at drc.uic.edu, via email at drc@uic.edu, or call (312) 413-2183 to create a plan for reasonable accommodations. To receive accommodations, you will need to disclose the disability to the DRC, complete an interactive registration process with the DRC, and provide me with a Letter of Accommodation (LOA). Upon receipt of an LOA, I will gladly work with you and the DRC to implement approved accommodations.

Religious Accommodations

Following [campus policy](#), if you wish to observe religious holidays, you must notify me by the tenth day of the semester. If the religious holiday is observed on or before the tenth day of the semester, you must notify me at least five days before you will be absent. Please submit [this form](#) by email with the subject heading: “**YOUR NAME: Requesting Religious Accommodation.**”

Pregnancy Accommodations

Following [campus policy](#), pregnant students have rights under Title IX. To request pregnancy-related accommodations, contact the Title IX Coordinator at titleix@uic.edu or 312-996-8670.

V. CLASSROOM ENVIRONMENT

Inclusive Community

UIC values diversity and inclusion. Regardless of age, disability, ethnicity, race, gender, gender identity, sexual orientation, socioeconomic status, geographic background, religion, political ideology, language, or culture, we expect all members of this class to contribute to a respectful, welcoming, and inclusive environment for every other member of our class. If aspects of this course result in barriers to your inclusion, engagement, accurate assessment, or achievement, please notify me as soon as possible.

Name and Pronoun Use

If your name does not match the name on my class roster, please let me know as soon as possible. My pronouns are *[she/her; he/him; they/them]*. I welcome your pronouns if you would like to share them with me. For more information about pronouns, see this page: <https://www.mypronouns.org/what-and-why>.

Community Agreement/Classroom Conduct Policy

- Be present by turning off cell phones and removing yourself from other distractions.
- Be respectful of the learning space and community. For example, no side conversations or unnecessary disruptions.
- Use preferred names and gender pronouns.
- Assume goodwill in all interactions, even in disagreement.
- Facilitate dialogue and value the free and safe exchange of ideas.
- Try not to make assumptions, have an open mind, seek to understand, and not judge.
- Approach discussion, challenges, and different perspectives as an opportunity to “think out loud,” learn something new, and understand the concepts or experiences that guide other people’s thinking.
- Debate the concepts, not the person.
- Be gracious and open to change when your ideas, arguments, or positions do not work or are proven wrong.
- Be willing to work together and share helpful study strategies.
- Be mindful of one another’s privacy, and do not invite outsiders into our classroom.

Content Notices and Trigger Warnings

Our classroom provides an open space for a critical and civil exchange of ideas, inclusive of a variety of perspectives and positions. Some readings and other content may expose you to ideas, subjects, or views that may challenge you, cause you discomfort, or recall past negative experiences or traumas. I intend to discuss all subjects with dignity and humanity, as well as with rigor and respect for scholarly inquiry. If you would like me to be aware of a specific topic of concern, please email or visit my Student Drop-In Hours.

VI. RESOURCES: Academic Success, Wellness, and Safety

We all need the help and the support of our UIC community. Please visit my **drop-in hours** for course consultation and other academic or research topics. For additional assistance, please contact your assigned college advisor and visit the support services available to all UIC students.

Academic Success

- UIC [Tutoring Resources](#)
- [UIC Library](#) and [UIC Library Research Guides](#).
- [Offices](#) supporting the UIC Undergraduate Experience and Academic Programs.
- [Student Guide for Information Technology](#)
- [First-at-LAS](#) Academic Success Program, focusing on LAS first-generation students.

Wellness

- **Counseling Services:** You may seek free and confidential services from the Counseling Center at <https://counseling.uic.edu/>.
- Access [U&I Care Program](#) for assistance with personal hardships.
- **Campus Advocacy Network:** Under Title IX, you have the right to an education that is free from any form of gender-based violence or discrimination. To make a report, email TitleIX@uic.edu. For more information or confidential victim services and advocacy, visit UIC's Campus Advocacy Network at <http://can.uic.edu/>.

Safety

- [UIC Safe App](#)—PLEASE DOWNLOAD FOR YOUR SAFETY!
- [UIC Safety Tips and Resources](#)
- [Night Ride](#)
- [Emergency Communications](#): By dialing 5-5555 from a campus phone, you can summon the Police or Fire for any on-campus emergency. You may also set up the complete number, (312) 355-5555, on speed dial on your cell phone.

VII. COURSE SCHEDULE

Weekly Schedule of Class Topics, Assignments, Assessments, Due Dates, and Deadlines

Tuesday Aug 22 2023. Description of the course and software packages. Class policies, and mathematical tools available for downloading.

Thursday Aug 24 2023. Linear Least Squares via Programming, and introduction to Matlab programming. Reading: Chapter 19 of "Mathematics for Physical Chemistry", and more importantly Chapters 1-3 of "MATLAB for the Physical Scientist"

Tuesday Aug 29 2023. Linear Least Squares via Programming Pt. II, Matlab scripts and functions. Reading: Chapters 1-3 of "MATLAB for the Physical Scientist"

Thursday Aug 31 2023. Introduction to Error Analysis. How to propagate error. Reading: Chapters 1-3 of "MATLAB for the Physical Scientist"

Tuesday Sep 05 2023. The Variance-Covariance Matrix Method. Error analysis for multivariable fits to data. Reading: Chapters 1-3 of “MATLAB for the Physical Scientist”

Thursday Sep 07 2023. Error Analysis Pt. II. Student’s T test, P values, and when to do experimental replicates. Reading: Chapter 19 of “Mathematics for Physical Chemistry”

Tuesday Sep 12 2023. Calculus of differentials. Reading: Chapter 1 of “Mathematics for Physical Chemistry”

Thursday Sep 14 2023. Multivariable Calculus Pt. I, differentiation using the chain rule and Euler’s Theorem and test. Reading: Chapter 12 of “Mathematics for Physical Chemistry”

Tuesday Sep 19 2023. Multivariable Calculus Pt. II, volumetric integration. Reading: Chapter 12 of “Mathematics for Physical Chemistry”

Thursday Sep 21 2023. Numerical methods for calculus. Differentiation using stencils and for loops in programs for integrating.

Tuesday Sep 26 2023. Integrals Pt. I. A general review of calculus integrals, with an emphasis on the use of units within integrals. Reading: Chapter 2 of “Mathematics for Physical Chemistry”

Thursday Sep 28 2023. Integrals Pt. II. Introduction to the erf function, integration by parts, and calculus identities. Reading: Chapter 2 of “Mathematics for Physical Chemistry”

Tuesday Oct 03 2023. Exam 1.

Thursday Oct 05 2023. Integrals Pt. III, more on Jacobians. Reading: Chapter 2 of “Mathematics for Physical Chemistry”

Tuesday Oct 10 2023. An introduction to probability distributions. Reading: Chapter 21 of “Mathematics for Physical Chemistry”

Thursday Oct 12 2023. A review of general statistics. Reading: Chapter 22 of “Mathematics for Physical Chemistry”

Tuesday Oct 17 2023. Complex Mathematics, an introduction to the complex plane. Reading: Chapter 5 of “Mathematics for Physical Chemistry”

Thursday Oct 19 2023. Differential Equations Pt. I. Classes of differential equations. Reading: Chapter 6 of “Mathematics for Physical Chemistry”

Tuesday Oct 24 2023. Differential Equations Pt. II. Introduction to solving ordinary differential equations. Reading: Chapter 6 of “Mathematics for Physical Chemistry”

Thursday Oct 26 2023. Differential Equations Pt. III. Separability for multivariable differential equations. Reading: Chapter 6 of “Mathematics for Physical Chemistry”

Tuesday Oct 31 2023. Differential Equations Pt. IV. Partial Differential Equations. Reading: Chapter 6 of “Mathematics for Physical Chemistry”

Thursday Nov 02 2023. Solving Differential Equations with a Series Pt. I. Part 2 of our examination of the solution to Laplace’s Equation. Reading: Chapter 7 of “Mathematics for Physical Chemistry”

Tuesday Nov 07 2023. Solving Differential Equations with a Series Pt. II. A solution to the Laplace Equation, the spherical harmonics! Reading: Chapter 7 of “Mathematics for Physical Chemistry”

Thursday Nov 09 2023. Exam 2

Tuesday Nov 14 2023. Introduction to the Laplace Equation. Starting on the solution to the 3D rigid rotor problem. Reading: Chapter 7 of “Mathematics for Physical Chemistry”

Thursday Nov 16 2023. Fourier Series. Introduction to the Fourier Transform. Reading: Chapter 9 of “Mathematics for Physical Chemistry”

Thursday Nov 16 2023. Fourier Series Pt. II, The discrete Fourier Transform and numerical methods and applications for FT. Reading: Chapter 10 of “Mathematics for Physical Chemistry”

Tuesday Nov 28 2023. The Fourier Transform. Reading: Chapter 10 of “Mathematics for Physical Chemistry”

Thursday Nov 30 2023. The Wave Equation and Quantum Mechanics. How the wave equation is derived from Maxwell’s Equation. Reading: Chapter 15 of “Mathematics for Physical Chemistry”

Disclaimer

This syllabus is intended to give the student guidance on what may be covered during the semester and will be followed as closely as possible. However, as the instructor, I reserve the right to modify, supplement, and make changes as course needs arise. I will communicate such changes in advance through in-class announcements and in writing via Blackboard Announcements.