

Physical Chemistry II: Quantum Chemistry

Course Information

Instructor: Marcus Cicerone (cicerone@gatech.edu)

Course Prefix and Number: CHEM 3412

Term: Fall 2026

Course Description – We will explore the development of quantum mechanics and its postulates to understand how it lays the foundation for chemistry, spectroscopy and thermodynamics. We will use simplified quantum mechanical model systems to understand the effects of these principles on electronic, vibrational, rotational energies of atoms and molecules and their associated spectroscopies. We will then apply these ideas to introduce statistical mechanics.

Course Learning Outcomes

- Understand the origins and key principles of quantum mechanics
- Apply these principles to simplified models of translation, vibration, rotation and columbic attraction
- Understand how these principles allow us to predict spectroscopic properties of atoms and molecules
- Understand how these principles allow us to predict chemical behavior of molecules
- Understand in principle how to extend model systems to approximate real systems
- Understand how quantum properties influence macroscopic thermodynamic properties

Required Course Materials

Course Text – [Peter Atkins, Physical Chemistry, 12th Edition, Oxford University Press](#)

Prerequisites – [General Chemistry \(CHEM 1212K\)](#), [Introductory Physics \(PHYS 2212\)](#)

Grading Policy

There are two midterm exams and a comprehensive final. The higher midterm exam score will count for 21% of the overall grade. The lower midterm exam score will count for 14% of the overall grade. The final exam will count for 25% of the total grade. Quizzes will count for 10% of the grade. The homework score will comprise the remaining 30% of the overall grade. Exams will reflect the homework and material discussed in class. All students are responsible for the material presented in class and the required textbook.

Grade Scale

- A – 100% to 90%
- B – 89% to 80 %
- C – 79% to 70%
- D – 69% to 60%
- F – 59% to 0%

Class Attendance and Participation – This course is “in person.” Accordingly, lectures will not be broadcast.

This course is challenging in that it is relatively fast-paced, and you will need to learn to think about matter in an entirely new way. We will spend time in class exploring new concepts in a manner that is designed to assist in mounting the conceptual barriers we will encounter. Because of this, it is of utmost importance that you attend class and participate. To encourage attendance and participation, we will usually have a quiz on the day’s material near the end of the class period.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit <http://www.catalog.gatech.edu/policies/honor-code/> or <http://www.catalog.gatech.edu/rules/18/>.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, which will investigate the incident and identify the appropriate penalty for violations.

You will be expected to sign each exam stating that you have completed the exam following these policies.

Core IMPACTS

Not applicable

Inclusivity

As a member of the Georgia Tech community, I am committed to creating a learning environment in which all of my students feel safe and included. Because we are individuals with varying needs, I rely on your feedback to achieve this goal. To that end, I invite you to enter into dialogue with me about the things I can stop, start, and continue doing to make my classroom an environment where every student feels valued and can engage actively in our learning community.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe it is important to strive for an atmosphere of mutual respect, acknowledgment, and responsibility between faculty members and the student body. See <http://www.catalog.gatech.edu/rules/22/> for an articulation of some basic expectations that you can have of me and that I have of you. Ultimately, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

CARE Center, Counseling Center, Stamps Health Services, and the Student Center

These uncertain times can be difficult, and many students may need help in dealing with stress and mental health. The **CARE Center** and the **Counseling Center**, and **Stamps Health Services** will offer both in-person and virtual appointments. Face-to-face appointments will require wearing a face covering and social distancing, with exceptions for medical examinations. Student Center services and operations are available on the **Student Center** website. For more information on

these and other student services, contact the Vice President and Dean of Students or the **Division of Student Life**.

Accommodations for Students with Disabilities

If you are a student with learning needs that require accommodation, contact the Office of Disability Services at (404)894-2563 or <http://disabilityservices.gatech.edu/>, as soon as possible, to make an appointment to discuss your needs and obtain an accommodations letter. Please also let me know as soon as possible.

Campus Resources for Students

Academic support

- Center for Academic Success <http://success.gatech.edu>
 - 1-to-1 tutoring <http://success.gatech.edu/1-1-tutoring>
 - Peer-Led Undergraduate Study (PLUS) <http://success.gatech.edu/tutoring/plus>
 - Academic coaching <http://success.gatech.edu/coaching>
- OMED: Educational Services (<http://omed.gatech.edu/programs/academic-support>)
 - Group study sessions and tutoring programs
- Communication Center (<http://www.communicationcenter.gatech.edu>)
 - Individualized help with writing and multimedia projects
- Academic advisors for your major <http://advising.gatech.edu/>

Personal Support

- The Office of the Dean of Students: <http://studentlife.gatech.edu/content/services>; 404-894-6367; Smithgall Student Services Building 2nd floor
 - You also may request assistance at https://gatech-advocate.symphlicity.com/care_report/index.php/pid383662?
- Counseling Center: <http://counseling.gatech.edu>; 404-894-2575; Smithgall Student Services Building 2nd floor
 - Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention. Their website also includes links to state and national resources.
 - *Students in crisis may walk in during business hours (8am-5pm, Monday through Friday) or contact the counselor on call after hours at 404-894-2204.*
- Students' Temporary Assistance and Resources (STAR): <http://studentlife.gatech.edu/content/need-help>
 - Can assist with interview clothing, food, and housing needs.
- Stamps Health Services: <https://health.gatech.edu>; 404-894-1420
 - Primary care, pharmacy, women's health, psychiatry, immunization and allergy, health promotion, and nutrition
- OMED: Educational Services: <http://www.omed.gatech.edu>
- Women's Resource Center: <http://www.womenscenter.gatech.edu>; 404-385-0230
- LGBTQIA Resource Center: <http://lgbtqia.gatech.edu/>; 404-385-2679
- Veteran's Resource Center: <http://veterans.gatech.edu/>; 404-385-2067
- Georgia Tech Police: 404-894-2500