Physics 689 Molecular Physics   TR 02:20 pm-03:35 pm (Room 109)

Instructor: Hans Schuessler  
Office: 422 Mitchell Physics Building  
Office Phone: 845-5455 Home: 846-7861  
Website: http://sibor.physics.tamu.edu  
Office Hours: T 3:35, or by appointment  
Email: schuessler@physics.tamu.edu

Grading: Final Exam 20%, Term paper 80%

Text: Molecular Physics by W. Demtroder ISBN: 978-3-540-10343-0  
Molecular Physics and Elements of Quantum Chemistry by H. Haken and H.C. Wolf

Topics:
1. Optical Cavities, Ray Approach for Periodic Focusing Systems
   A. Review of Maxwell’s Equation
   B. Ray Matrices
   C. Gaussian Beams
   D. Stability Criterion and Diagram
   E. Optical Resonator Configurations
   F. Ray Tracing in a Stable Cavity
2. Molecular Spectroscopy
   A. Basic Concepts
      1. Molecular Bonding
      2. Rotation and Vibration Spectra
      3. Electronic States
   B. Electronic States and Spectra
      1. Adiabatic approximation and molecular potentials
      2. Born-Oppenheimer approximation
      3. The rigid H₂⁺ molecule
      4. Separated and united atom approximations
      5. Correlation diagrams
   C. Rotation and Vibrational Structure of Diatomic Molecules
      1. The Fixed Rotor
      2. The Harmonic and Anharmonic Oscillator
   D. Spectra of Diatomic Molecules
      1. Transition Probabilities
      2. Thermal Population of Molecular Levels
3. Experimental Techniques of Atomic and Molecular Physics
   1. Laser-Absorption Spectroscopy
   2. Intra-Cavity Laser Spectroscopy
   3. Infrared Fourier spectrosopies

American with Disabilities Act (ADA) Policy Statement:
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 979-845-1637. For additional information visit: http://disability.tamu.edu.
**Academic Integrity Statement:** The Aggie Honor Code is “An Aggie does not lie, cheat, or steal or tolerate those who do.” For more information, refer to the Honor Council Rules and Procedures on the web at [http://www.tamu.edu/aggiehonor](http://www.tamu.edu/aggiehonor).