PHYSICS 318:   **SPRING - 2005**

INTRODUCTION TO MODERN PHYSICS II

- **Instructor:**   Dr. Igor Ostrovskii

➢ **Course objectives:**

1. Introduce the physics major students to 20-th century physics;
2. Expand an understanding of the intuitive ideas of quantum physics;
3. Develop an understanding of the current basis of broad knowledge in physics;
4. Discuss the problems confronting physics in the 21-st century.

   ❖ **Lecture:** TTh 8:00 – 9:15, Room 109 Lewis Hall
   ❖ Office: Room 207 Lewis Hall, Tel: 915-1536; Email: iostrov@phy.olemiss.edu
   ❖ Office Hours: MWF 2:30 – 3:30 p.m. (207 Lewis Hall)

- **Text**: Modern Physics, by R.A. Serway, C.J. Moses and C.A. Moyer, Third edition.
- **Additional reading**: David Griffits. Introduction to Elementary Particles (Chapter 1).

We will cover Chapters 8 – 12, 15.

PLEASE, READ THE BOOK

- Grading Scale: A's -------------------- 90 – 100
                             B's -------------------- 80 – 89
                             C's -------------------- 70 – 79,   Etc.

- Grades will be based on homework, tests, and the final examination:
                 Homework ----------- 20%
                 Three tests ------------ 45% (#1=15%, #2=15%, #3=15%)
                 Final exam ------------ 35%
                                                   100

- Tests and Final examination schedule:

   Test 1 (Class # 9), Chapters 8, 9   ------------------- Thursday, February 15.
   Test 2 (Class # 20), Chapters 10, 11, 12-A ----------- Thursday, March 31.
   Test 3 (Class # 29), Chapters 12B, 15 ---------------Tuesday, May 3.

   ➢ **FINAL EXAMINATION   ------------ Monday, May 9, 8:00 a.m.**

- Homework Rules:
1. Homework is assigned after some sections are covered and is due in a week.
2. Homework paper should be 8.5 x 11 inches with no torn or tattered edges. Homework papers should be stapled.
3. Show all your work; the answer alone is not worth anything. Homework problems must include enough English to be understandable.
4. Homework answers should have units and a reasonable number of significant digits.
5. **Circle the finale answers that you want to be graded.**

SYLLABUS

Ch. 8. QUANTUM MECHANICS IN THREE DIMENSIONS   [4 classes]
- Particle in a three-dimensional box.
- Central forces, angular momentum, space quantization.

- Atomic hydrogen and hydrogen-like ions.

Ch. 9. ATOMIC STRUCTURE [4 classes]
- Orbital magnetism, Normal Zeeman effect.
- The spinning electron, the spin-orbit interaction, exchange symmetry.
- The periodic table, X-ray spectra, Moseley's Law.

TEST 1: (Class # 9) Chapters 8 and 9 → Thursday, February 15.

Ch. 10. STATISTICAL PHYSICS [4 classes]
- The Maxwell-Boltzmann distribution.
- Quantum statistics.
- Applications of Bose-Einstein statistics.
- Application of Fermi-Dirac statistics.

Ch. 11. MOLECULAR STRUCTURE [3 classes]
- Bonding mechanisms.
- Molecular Rotation and Vibration.
- Molecular Spectra.
- Electron Sharing and the Covalent Bond.

Ch. 12-A. THE SOLID STATE I (Sections 12.1, 2, 3) [3 classes]
- Bonding in solids.
- Classical Free-Electron Model.
- Quantum Theory of Metals.

TEST 2: (Class #20) Chapters 10 – 12A → Thursday, March 31.

Ch. 12-B. THE SOLID STATE II (Sections 12.4, 5, 6, 7) [5 classes]
- Band Theory of solids.
- Semiconductor Devices.
- Superconductivity.
- Lasers.

Ch. 15. ELEMENTARY PARTICLES [3 classes]
- The fundamental forces in nature.
- Antiparticles. Mesons.
- Classification of particles.
- Conservation Laws.
- Quarks.
- Electroweak theory and the standard model.

TEST 3: (Class #29) Chapters 12B, 15 → Tuesday, May 3.

REVIEW [1 class]

❖ **FINAL EXAMINATION: Chapters 8 – 12, 15 → Wednesday, May 5, 8:00 a.m.**

* - The dates of three tests are tentative, and may be changed.