Phys 318 Introduction to Modern Physics II Dr. Ostrovskii Spring-2014

- Instructor: Dr. Igor Ostrovskii
- **Lecture: TTh 9:30 – 10:45, Room 109 Lewis Hall**
- **Office: Room 207 Lewis Hall; Email: iostrov@phy.olemiss.edu**
- **Office Hours: M, Th 3:30 – 4:30 p.m. (207 Lewis Hall) + by appointment**

- **Text**: **Modern Physics, by Paul A. Tipler, Ralph A. Llewellyn, 6th edition.**

ISBN-13: 978-1-4292-5078-8; ISBN-10: 1-4292-5078-X

We will cover Chapters 7 through 10, AND Chapters 12, 13.

PLEASE, READ THE BOOK

- **Additional reading**:

1) Experiment in Modern Physics, by Adrian Melissinos and Jim Napolitano, 2nd edn. Academic Press.

ISBN-13: **978-0124898516** ; ISBN-10: **0124898513**

2) Introduction to Elementary Particles, by David Griffits, Chapter 1. (ISBN: 0-471-60386-4)

PLEASE, READ THE BOOKS.

- **Course learning objectives:**

In the learning objectives, we answer a question: "What will the students know and be able to do as a result of taking this class and passing the final examination."

1. Introduce the physics major students to the physics of 2nd half of 20-th century;
2. Expand an understanding of the ideas and results of the solid state physics and particle physics;
3. Develop understanding of a current basis of broad knowledge in modern physic of 2nd half of 20-th century;
4. Enhance the critical thinking, analytical reasoning and problem solving skills;
5. Discuss the problems confronting modern physics including solid-state and particle physics in the 21-st century.
6. Develop in learners an ability to present orally their scientific knowledge and findings, which will be achieved with the help of student scientific presentations.

The learning outcomes for students:

1. Understand the basic principles of the Physics of 2nd half of 20th century *including but not limited to* Atomic structure, Statistical physics, Molecular structure, Solid State physics, and Particle physics.
2. Understand the physical basis of numerous contemporary applications of Condensed Matter physics and Particle physics.
3. Understand the intuitive ideas of the Particle physics.
4. Students will develop a comprehension of the current basis of broad knowledge in Condensed Matter physics, which is integral part of Modern physics.
5. Learners will build on a critical thinking, analytical reasoning, and problem solving skills.
6. They will know about the problems confronting modern physics in 21st century.
7. Students will know how to use interactive methods and Internet for their independent learning on "Introduction to Modern Physics II" especially that part that describes the latest results in Solid State and Particle physics.

❖ **GRADING SCALE:** **A's ---------- 89 – 100**
B's ---------- 79 – 88
C's ---------- 69 – 78
D's ---------- 59 - 68

❖ **EVALUATION**:

❖ Grades are based on: The home works, tests, **class activity**, presentation, and final examination:

Home works --13%;
Three tests --- 42% (3x14%);
Class activity --- 10 % for no absences,
7% for 1 absence; 5% for 2 absences,
0% for 3 absences;
- 2% for each absence after 3.
Presentation --- 10% ;
Final exam ---25 %;
TOTAL = 100 points

- **Chapter Tests and Final Examination schedule:**

Test 1 (Class # 9), Chapters 7, 8 → Tuesday, February 25.

Test 2 (Class # 17), Chapters 9, 10A → Thursday, March 27.

Test 3 (Class # 24), Chapter 10B, 12 → Thursday, April 22.

FINAL EXAMINATION → Tuesday, May 8, 8 a.m. -11 a.m.

- ***EXAMS may not be "worked out," EXAM at its day/time will be the only one. Please, plan your calendar without absences at the Exam's dates.***

Requirements of the course and 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.
3. Homework papers should be stapled.
4. Show all your work; the answer alone is not worth anything.
5. Homework problems must include diagrams, initial equations, calculations, explanations of what you are doing / reasoning, enough English to be understandable.
6. Homework answers should have units and a reasonable number of significant digits.
7. **Circle the finale answers that you want to be graded.**
8. Classroom Policies on **ABSENCES**: Please bring in a **document** that explains your absence. **Absence** may jeopardize your standing because **you are responsible for any in-class activities.**
9. **CONDUCT:**
   - While in class, you are expected to attend to and participate in discussion; you are **NOT** allowed to engage in private conversation or other behaviors that would disrupt class activities.
   - **Turn off your phones before class!**
   - You are expected to be civil to others in the class.

❖ **The University of Mississippi Regulations Governing All Examinations:**

A student's failure to appear for an examination without an acceptable excuse, inability to present valid identification, absence from the room during the course of an examination without the consent of the examiner, or attempting any portion of an examination without submitting his or her answers shall result in failure of the examination. Tardiness beyond 15 minutes forfeits a student's right to an examination. **During the period of Wednesday through Friday** of the last week of class, instructors are not to give exams, tests, or quizzes that contribute more than 10% of the final grade for a class.

COURSE CONTENTS:

Ch. 7. ATOMIC PHYSICS [4 classes]

- Schrodinger equation in a three dimens.
- Angular momentum, Energy of H-atom.
- Atomic hydrogen: wave functions.
- Electron spin. Total angular momentum, Spin-orbit interaction.
- Ground state of atoms; periodic Table.

Ch. 8. STATISTICAL PHYSICS [4 classes]

- The Maxwell-Boltzmann distribution.
- Quantum statistics, bose-Einstein condensation.
- The photon gas.
- The Fermion gas.

Test 1 (Class # 10), Chapters 7, 8 → Tuesday, February 25 [1 class]

Ch. 9. Molecular Structure and Spectra. [4 classes]

- Bonding mechanisms.
- Molecular Spectra.
- Absorption and Stimulated Emission.

Ch. 10A. Solid State Physics. [3 classes]

- The structure of solids. Classical theory of conductivity.
- Free-Electron gas in metals, and Quantum theory of conductivity.
- Magnetism in solids.
- Band theory of solids.

Test 2 (Class # 17), Chapters 9, 10A → Thursday, March 27 [1 class]

Ch. 10B. Solid State Physics. [2 classes]

- Impurity Semiconductors.
- Semiconductor Junctions and Devices.
- Superconductivity.

Ch.12. Particle Physics. [4 classes]

- Basic Concepts.
- Fundamental interactions and the force carriers.
- Conservations Laws and Symmetry.
- The Standard Model.
- Beyond the Standard Model.

Test 3 (Class # 24), Chapter 10B, 12 → Tuesday, April 22 [1 class]

Ch. 13. Astrophysics. ***PRESENTATIONS*** [2 classes]

LAST CLASS #27: ***PRESENTATIONS*** **.** REVIEW & FINAL HELP [1 class]

FINAL EXAMINATION → Thursday, May 8, 8 a.m. -11 a.m.

* - The dates are tentative, and may be changed, **BUT NOT THE FINAL EXAMINATION**.