

- **Instructor:** Dr. Igor Ostrovskii
- ❖ **SYLLABUS**
- **Lecture:** T, Th 09:30-10:45, Room 109 Lewis Hall
- **Office:** Room 207 Lewis Hall; Email: iostrov@phy.olemiss.edu
- **Office Hours:** Th 3:15 – 4:15 p.m. + by appointment (207 Lewis Hall).

1. **Text:** Modern Physics, by Paul A. Tipler, Ralph A. Llewellyn, 6<sup>th</sup> edition.

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

**We will cover Chapters 8 through Chapter 12.**

***PLEASE, READ THE TEXT***

- **Additional reading:** 1) Experiment in Modern Physics, by Adrian Melissinos and Jim Napolitano, 2<sup>nd</sup> edn. Academic Press. ISBN-13: 978-0124898516 ; ISBN-10: 0124898513

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

- **IMPORTANT:** The UM requires that all students have a verified attendance.

**Attendance and participation:** Attendance is expected and may be recorded each day of class. To comply with attendance verification requirements, a report of your attendance will be made.

- **COVID-19 policy:** Faculty members and students must wear facemask or face covering while in the class room, hallways, etc. Students and faculty should stay 6 feet apart while entering and exiting any classroom.

## 2. **Information about the grading process and standards**

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

- **EVALUATION:** Grades will be based on the home works, tests, presentation, class activity and final examination: Home works ---15 points / Two tests --- 38 points (2 chapter tests x 19 points each) / Presentation --- 9 points ; Class activity --- 8 points for no more than one university-unrelated absences, (6 points for 2 absences; 4 - for 3 absences, 0 - for 4 absences; (- 2) points for each absence after 4)

**Final exam ---30 points // TOTAL = 100 points**

## 3. **Outline of covered topics and test dates**

### **Ch. 8. Statistical Physics**

[4 classes]

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

### **Ch. 9. Molecular Structure and Spectra.**

[4 classes]

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

### **Ch. 10A. Solid State Physics I.**

[1 class]

- The structure of solids.

**Test 1 (Class #10), Chapters 8, 9, 10 A; Thursday, February 18**

[1 class]

### **Ch. 10B. Solid State Physics II.**

[6 classes]

- Classical theory of conductivity.
- Free-Electron gas in metals.
- Quantum theory of conductivity.
- Band theory of solids. Impurity Semiconductors.
- Semiconductor Junctions and Devices. Superconductivity.

## Ch. 11. Nuclear Physics

[5 classes]

- The composition of the nucleus.
- Ground-state Properties of nuclei.
- Radioactivity.
- Alpha, Beta, and Gamma Decay.
- The nuclear force.
- The shell model.
- Nuclear reactions.
- Fission and Fusion.
- Applications.
- **Test 2 (Class # 22), Chapters 10B, 11 Thursday, April 1**

[1 class]

## Ch.12A. Particle Physics.

[3 classes]

- Basic Concepts.
- Fundamental interactions and the force carriers.

## Ch.12B. Particle Physics. PRESENTATIONS:

[2 classes]

- Conservation Laws and Symmetry.
- The Standard Model. Beyond the Standard Model.

**LAST CLASS #28:** 1) *Presentations & Analysis*. 2) **REVIEW & FINAL HELP**

[1 class]

- **FINAL EXAMINATION: Thursday, April 29, 2021, 8 a.m. -11 a.m.**

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

## 4. Lecture and test requirements

- **Faculty Notification Letter is required from a student with disabilities** for a special accommodation in a class-room under UM Policies and SDS procedure.
- **Any recording in class** is in contradiction with the Copyright Law and **is not permitted.**
- **Turn off your phone before class!**
- **Please make your own lecture notes.** Note taking skills should be developed.
- It is not allowed to use the smartphones, programmable calculators, etc. during exams.
- It is articulated and stressed the role of **daily class participation** in the learning process.
- Absence may jeopardize your standing & you are responsible for any in-class activities.
- **Academic integrity:** 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. You are expected to be civil to others in the class.

## 5. Homework requirements

- Homework is assigned after some sections are covered and is due in a week.
- **Write your paper by at least 12-point font or bigger; alternatively use a printer.**
- Homework papers should be stapled allowing their reading and grading.
- **Show all your work; the answer alone is not worth anything.**
- **Homework papers must include:** diagrams, equations, derivations, calculations, and explanations of what you are doing / reasoning, **enough English** to be understandable; and **encircled final answer/solution.**
- Homework answers should have units and a reasonable number of significant digits.
- **Encircle the answers that you want to be graded. (Nothing encircled,- nothing graded).**

## 6. General description of course purposes

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

## **7. Learning objectives of the course**

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."

**After completing this course, a student should be able to:**

- Understand the basic principles of the Physics of 2<sup>nd</sup> half of 20<sup>th</sup> century *including but not limited to* Atomic and Molecular structure, Statistical and Solid State physics, and Particle physics.
- Understand the physical basis of numerous contemporary applications of Condensed Matter physics and Particle physics.
- Understand the intuitive ideas of the Particle physics.
- Students will develop a comprehension of the current basis of broad knowledge in Condensed Matter physics, which is integral part of Modern physics.
- Learners will build on the **critical thinking, analytical reasoning, and problem solving skills.**
- They will know about the problems confronting modern physics in 21<sup>st</sup> century.
- 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 and applications in Solid State and Particle physics.

8. Prepare and make a scientific presentation.

## **8. Other policies**

- ***Attendance / absences:*** Please bring in a **document** that explains your absence.
- ***It is articulated and stressed the role of daily class participation in the learning process.***
- ***Absence may jeopardize your standing because you are responsible for any in-class activities.***
- ***Use of electronic devices:*** Please, **Turn off your phone before class!**
- ***Academic integrity:*** 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. 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.*
- ***Last Week Policy:*** 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.
- ***UM Attendance guidelines:*** Faculty and staff who supervise student organizations and teams, including NCAA sports teams, are expected to schedule competitions and performances in such a way as to minimize the number of classes that students will miss. *Names of participating students and the dates of class conflicts should be provided to the students' instructors prior to participation.* In cases where absence from class results from travel delays or the unanticipated continuation of participation in a competition, the student or supervisor should inform the instructor within one business day so that reasonable accommodations for absences due to university-sponsored activities can be made.
- ***UM Attendance guidelines:*** If a **student informs** an instructor in advance about an anticipated absence and the instructor decides not to provide an accommodation for a major exam or assessment, the student may appeal to the department chair or program director (or dean, when the instructor is chair or program director) who oversees the course. An appeal must be based on **(a)** failure of the instructor to articulate a policy, **(b)** failure of the instructor to follow the articulated policy, or **(c)** failure by the instructor to offer a reasonable accommodation for a documented absence that caused a student to miss an assessment that is **worth 20% or more of the course grade.**  
Under UM Attendance Guidelines, - **No accommodations for missed chapter tests will be made.**

- If the instructor articulates in the syllabus the role of daily class participation in the learning process, **reasonable grade deductions can be made for absences.**
- **The Faculty Senate** produced in November 2015 the document, which encourages faculty members to include the following text in their syllabi:

*"All materials distributed electronically and in hard copy in this class are protected under intellectual copyright. Any attempt to upload these documents onto the Internet (or to distribute them by some other means) or to profit from the distribution (by Internet or other means) of these documents constitutes theft and will be in violation of intellectual property law and the UM Academic Conduct Code unless expressly permitted for by the instructor. Accessing such materials for your own use is also in violation of the UM Academic Conduct Code. Additionally, the distribution of your own class notes via the Internet or other means, or access of such materials, encourages absence from class and is highly discouraged."*

**9. Chapter Tests and Final examination schedule:**

- *Test 1 (Class #10), Chapters 8, 9, 10 A; Thursday, February 18*
- *Test 2 (Class # 22), Chapters 10B, 11 Thursday, April 1*
- **FINAL EXAMINATION ----- Thursday, April 29, 2021, 8 a.m. -11 a.m.**