- **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: M 3:30 – 4:30 p.m. & Th 3:30 – 4:30 p.m. + by appointment** (207 Lewis Hall).

- **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 Chapter 12.

PLEASE, READ THE TEXT

- **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)

- ***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.**

1. General description of the course's purpose

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 knowledge in modern physic of 2nd half of 20thcentury.
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 21st 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.

2. 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:

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 the **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 and applications in Solid State and Particle physics.
8. Prepare and make a scientific presentation.

3. Description of examinations and other student requirements

Chapter Tests and Final examination schedule:

- **Test 1 (Class # 10), Chapters 7, 8; Thursday, February 25.**
- **Test 2 (Class # 19), Chapters 9; 10A Tuesday, April 5**
- **Test 3 (Class # 25), Chapters 10B, 12A; Tuesday, April 26.**
- **FINAL EXAMINATION ------ Thursday, May 12, 8:00 a.m. to 11 a.m.**

Lecture and test requirements:

- Turn off your phone before class!
- It is not allowed to use of any smart devices (smartphones, programmable calculators, etc.) during exams.
- Any recording in class is in contradiction with the Copyright Law and is not permitted.
- Note taking skills should be developed. Please make your own lecture notes.
- 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**.**
- ***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.

Homework requirements:

- Homework is assigned after some sections are covered and is due in a week.
- Homework paper should be 8.5 x 11 inches with no torn or tattered edges.
- 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.
- Homework answers should have units and a reasonable number of significant digits.
- **Encircle** the answers that you want to be graded. ***(If Nothing is encircled -> Nothing is graded*)**.

4. 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 -- 12 points
Three tests -- 45 points (3 chapter tests x 15 points each)
Presentation - --13 points
Class activity - - 10 points for zero university-unrelated absences,
(7 points for 1 absence; 5 - for 2 absences, 0 - for 3 absences; (- 2) points for each absence after 3**)**
Final exam ---20 points
TOTAL = 100 points

5. Outline of covered topics

Ch. 7. ATOMIC PHYSICS [5 classes]

- Schrodinger equation in a three dimensions.
- 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; Thursday, 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. [4 classes]

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

Test 2 (Class # 19), Chapters 9, 10A Tuesday, April 5 [1 class]

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

- Band theory of solids.
- Impurity Semiconductors.
- Semiconductor Junctions and Devices.
- Superconductivity.

Ch.12A. Particle Physics. [2 classes]

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

Test 3 (Class # 25), Chapter 10B, 12; Tuesday, April 26 [1 class]

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]

6. 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**.***
- ***Class participation***: 10 points for zero university-unrelated absences, **(**7 points for 1 absence; 5 - for 2 absences, 0 points for 3 absences; (- 2) points for each absence after 3**)**
- ***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**.
- Based on UM "Class 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.**

- **FINAL EXAMINATION Thursday, May 12, 2016, 8 a.m. -11 a.m.**

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