Welcome to Physics 3301 Introduction to Quantum Physics a.k.a Modern Physics Fall, 2024



Prof. Sung-Won Lee Dept. of Physics & Astronomy Texas Tech University

8/22/2024

Syllabus PHYS 3301, Modern Physics Fall 2024

Course Section Instructor Class Time Classroom Office Office Hours e-mail Phone Course Web

PHYS 3301 Dr. Sung-Won Lee TR 8:00 am - 9:20 am Science 112 Science 101 TR 2:00 - 3:00 pm, or by appointment sungwon.lee@ttu.edu (806) 834-8188 http://www.phys.ttu.edu/~slee/3301/



TEXAS TECH UNIVERSITY" Department of Physics

Course webpage

Textbook

Modern Physics, 2/E

Randy Harris, University of California, Davis

ISBN-10: 0805303081 • ISBN-13: 9780805303087 ©2008 • Addison-Wesley • Cloth, 656 pp Published 07/26/2007 • Instock

MODERN PHYSICS



Welcome to the PHYS 3301 Course :: Fall 2024

[PHYS 3301] Principles of Physics IV: Introduction to Quantum Physics Prerequisite: PHYS 1408 and MATH 2450. Corequisites: PHYS 3201 or PHYS 3101.

Failure of classical physics in the microscopic realm, development and fundamentals of quantum theory, applications to atoms, molecules, solids, nuclei, and particles.

Course Syllabus:: Dr.Lee's class (3301)

CLASS SCHEDULE

TR 8:00 am - 9:20 pm @SC 112

COURSE TEXT

Modern Physics, 2nd edition, by Randy Harris (ISBN-10: 0805303081 or ISBN-13: 9780805303087)

COURSE OBJECTIVE

• The objective of this course is to develop a solid understanding of simple quantum mechanical systems, hydrogen atom, spin, atomic physics, solid state physics, nuclear physics and fundamental particle interactions.

COURSE COVERAGE

· We will start with a discussion of simple quantum mechanical systems and explore the Schrödinger equation. We will later concentrate on the hydrogen atom, spectroscopy, and advanced topics in the text.

GRADING POLICY

The following scores will be accumulated during the course of the semester:

- Homework (15%)
- Term Paper + Presentation (10%)
- Mid-term Exams (40%)
- Final Exam(35%)
- No makeup exams will be given.

Your letter grade will be determined according to the following scale: A (90-100), B (80-89), C (70-79), D (60-69) and F(0-59).

HOMEWORK

. Homework sets will be assigned regularly (see the class schedule) and will be based on the material presented in class.

HW Assignments:

ſ	Date	Due	Chapter	Homework Assignments
				[[

TERM PAPER

A term paper will be written (5-10 pages).

- . Topic for the term paper will be decided in consultation with the instructor based on the topics covered in the lab and the course.
- Term paper grade is 10% of your grade.
- . I encourage you to attend the Physics Colloquium, You might find a topic interesting and decide to write your paper on that,

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COURSE INSTRUCTORS



Dr. Sung-Won Lee Professor and Chair Department of Physics and Astronomy Office:: SC 101/117 (806) 834-8188 sungwon.lee@ttu.edu

LECTURE NOTES

8/22 Ch.1 PDF

Course Objective

The objective of this course is to develop a solid understanding of simple quantum mechanical systems, hydrogen atom, spin, atomic physics, and some selected topics in solid state physics, nuclear physics, and fundamental particle interactions.

Course Content

We will start with a discussion of simple quantum mechanical systems and explore the Schrodinger equation. We will later concentrate on the hydrogen atom, spectroscopy, and advanced topics in the text.

• This course has several components:

- 1 Lecture: lecture, demos and active learning
- **Reading**: study the text **BEFORE** lecture
- 3 Homework: individual problem solving
- **④** Term paper & oral presentation

• Homework:

- ① Homework sets will be assigned regularly (weekly basis)
- ② Homework assignments will be collected (during class)
- ③ Doing well on the homework is crucial to your success in the course.

• Term Paper:

- ① A term paper will be written (5-10 pages) and orally presented (15 minutes: TBD).
- ② Topic for the term paper will be decided in consultation with the instructor based on the topics covered in the the course.
- ③ Term paper grade is 10% of your total grade.
- ④ I also give you the Physics Colloquium schedule (every Tuesday at 3:30 pm) and encourage you to attend these high-profile talks. You might find a topic interesting and decide to write your term paper on that

Exams

- There will be 2 in-class mid-term exams and one final exam (see the class schedule for dates).
- The exams are closed book. Note cards, smart phones, iPad and other gizmos are not allowed. Calculators are allowed.
- The final exam is comprehensive.
- There will be no make-up exams.



• The course grade will be based on 2 midterm exams, the final exam, Homework, term paper/presentation, and labs.

Homework	15%
Term Paper & Presentation	10%
Mid-Term Exams	40%
Final Exam	35%
Total	100%

Help(s)

- Please do not wait until the last second to seek help. If you do not understand the material or feel that you are falling behind, seek help as soon as possible.
- I am available during office hours. If you cannot make it, call me or e-mail me.

Dr. Sung-Won Lee, where: Sci 101, when: TR 2:00-3:00 contact phone #: 834-8188

End of Administrative Details

Go to Lecture 1

PHYS-3301

Lecture 1

Aug. 22, 2024









Modern Physics

- Two basic ideas
 - Time and space are not absolutes.
 - Particles behave like waves and waves behave like particles.
- Two branches
 - Special Relativity
 - Quantum Mechanics





With an understanding of these branches, we can then explore areas of modern physics such as superconductivity, modern optics, nuclear physics, particle physics and cosmology - along with a host of other areas of science.