

Physics III – Modern Physics

Physics 2402

Spring 2010

Section	PHYS 2402
Instructor	Dr. Sung-Won Lee
Class Time	TT 9:30-10:50
Classroom	SC 10
Office	SC 117
Office Hours	TT 1:30-3:00 PM, or by appointment
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Course Web page	http://highenergy.phys.ttu.edu/~slee/2402/

Texts:

Modern Physics, 2nd edition, by Randy Harris (ISBN-10: 0805303081 or ISBN-13: 9780805303087). We will use this book as our main text. I will assign reading and problem assignments from this book.

Supplementary Reference Texts:

There are several good introductory textbooks in modern physics. I list some of my personal preferences and I encourage you to study from any textbook that you feel is helpful. The last two books are useful for the lab part of the course.

1. Paul A. Tipler and Ralph A. Llewellyn, Modern Physics, W.H. Freeman, 2000
2. John Taylor and Chris Zafaritos, Modern Physics for Scientists and Engineers
3. E. Taylor and J. Wheeler, Spacetime Physics, 2nd Ed., W.H. Freeman, 1992
4. J. Bernstein, P. M. Fishbane, and S. G. Gasiorowicz, Modern Physics
5. M.L. Boas, Mathematical Methods in the Physical Sciences, John Wiley and Sons, 3rd Ed., 2006
6. J. R. Taylor, An Introduction to Error Analysis, 2nd Ed., University Science Books, 1997
7. A. C. Melissions and J. Napolitano, Experiments in Modern Physics, Academic Press, 2003

Course Objective:

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

Course Coverage:

We will start with a discussion of special theory of relativity, move to simple quantum mechanical system and explore the Schrodinger equation. We will later concentrate on the hydrogen atom and spectroscopy. Time permitting; the course will cover material from the first 10 chapters in the text.

Homework:

Homework sets will be assigned regularly and will be based on the material presented in class. Homework assignments will be collected. There will be 20~30-minute-long quizzes on the dates indicated based on homework assignments and the materials presented in class. There will be 4 sets (see class schedule). Doing well on the homework is crucial to your success in the course. Working on the homework problems by yourself is a good idea. You will know if you understand the topic or not. Of course, you are welcome to discuss the questions with me, the lab TA and your classmates.

Lab (2402-501):

You will be working on several different experiments in the lab (Sci 301B). There is one lab section on Monday afternoon 2:00 to 5:00 PM. Laboratory experiments are an integral part of this course. Nine experiments will complement the topics discussed in class. You will setup experiments, collect data and analyze the information. You will also keep a logbook with all the information about your lab work. The lab manual gives sufficient information to get you started on each these experiments. At the end of each experiment, there are questions that you are asked to answer in your report. The final lab reports will be graded. **Consult with your TA (Payam Norouzzadeh, e-mail: pavam.norouzzadeh@ttu.edu) about details of the 2402 lab.**

Term Paper:

A term paper will be written (5-10 pages) and orally presented (15 minutes). Topic for the term paper will be decided in consultation with the instructor based on the topics covered in the lab and the course. The term paper will have to conform to the Physical Review, *RevTeX4*, see URL <http://authors.aps.org/revtex4/> guidelines. Term paper grade is 10% of your grade. I also give you the Physics Colloquium schedule and encourage you to attend these talks. You might find a topic interesting and decide to write your term paper on that.

Attendance: I expect all will attend class and participate in discussion. If you have an excuse for not coming to class, you can call or email me.

Exams: There will be only one in-class closed book and a final in-class exam.

Grading:

The course grade will be based on the quizzes, labs, mid-term exam, and the final exam. **NO MAKEUP EXAMS WILL BE GIVEN.** Your letter grade will, tentatively, be determined according to the following scale: 100-85:A, 85-70:B, 70-55:C, 55-40:D and 40-0:F.

4 Quizzes (each 5%)	20%
Lab work	25%
Term Paper	10%
Mid-term Exam	20%
Final Exam	25%
Total	100%

Course Goals:

This course is intended to acquaint students with the basic laws of modern physics, to develop a better understanding of physical science in general, and help prepare you for other upper division physics classes. To this end, the course will emphasize a mix of conceptual understanding and standard "end-of-chapter" homework solving skills.

Expected Learning Outcomes:

Understanding of special theory of relativity, historical modern physics experiments and their influence on physics, quantum mechanical phenomena, and proficiency in mathematical techniques used in basic quantum mechanics.

Assessment:

Assessed by class discussion of the course materials, review of the lab logbook and the term paper, interactions in problem solving sessions, quizzes and the two exams.

Important Notes:

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.

Strategy for Success:

- Be prepared! Study your notes and read the material in the text *before* we cover it in class. This will help you keep up; will make for more productive classroom interaction.
- Begin all homework assignments as soon as possible. The assignments take time and thought. The homework is graded separately, and the test questions are based on the problems you do in the homework. Homework is essential to pass.
- Build a study group or join one. Students' helping each other is very effective.
- Never wait until the night before a test to "begin" studying.
- The course schedule is fast. Don't get left behind.
- Come see your instructor when you have a problem to understand the course materials.

PHYS 2402 Schedule Spring 2010

Week	Topic	Chapter	Tue	Thr
1	Introduction	1		1/14
2	Special Relativity	2	1/19	1/21
3	Special Relativity Wave & Particle I	2 3	1/26	1/28
4	Waves & Particles I,II	3,4	2/2	2/4 (Q1)
5	Waves & Particles II	4	2/9	2/11
6	Bound States	5	2/16	2/18 (Q2)
7	Bound & Unbound States	5,6	2/23	2/25
8	Unbound States	6	3/2	3/4 (Exam)
9	Particle-Wave Hydrogen Atom	6,7	3/9	3/11
10	Spring Vacation		3/16	3/18
11	Hydrogen Atom	7	3/23	3/25
12	Hydrogen Atom Spin & Atomic Physics	7,8	3/30	4/1 (Q3)
13	Spin & Atomic Physics Statistical Mechanics	8,9	4/6	4/8
14	Statistical Mechanics Molecules & Solids	9,10	4/13	4/15
15	Molecule & Solids Nuclear Physics	10,11	4/20	4/22 (Q4)
16	Particle Physics Seminar (4/29)	12	4/27	4/29
17	Summary		5/4	5/7 (Fri) Final Exam

1/14 – First Day of Class (2402)

3/13 ~ 3/21 – Spring Vacation

5/4 – Last Day of Class (2402)

5/7 – Final Exam (1:30 pm – 4:00 pm; Room Sci. 10)

Quizzes: Q1, Q2, Q3, Q4