PHYSICS 102: Modern Physics

Instructor: Hee-Sun Lee, Ph.D., ISB 218, hlee58@ucsc.edu, phone: 831-459-2326
Course location: Thimann Lab 101
Course website: https://griffin.ucsc.edu/ph102-14/FrontPage
Lecture schedule: TTH 12:00 pm – 1:45 pm
Office hour schedule: (or by appointment), ISB 218
Textbook: Modern Physics (2nd ed) by Randy Harris

Course Objectives:

- Learn important topics in modern physics qualitatively and conceptually.
- Explain topics in modern physics in your own words.
- Familiarize with big ideas and practices that underlie scientific research in physics.

Grading

- Mid-term I (20%) on 1/28, Tuesday, during class, quantum and atomic physics
- Mid-term II (20%) on 2/20, Thursday, during class, statistics and solid state physics
- Final (40%) on 3/19, Wed, 8-11 am, during the final exam week
- Homework (15%): Best five out of six homework sets
- Class work (5%), Group work during class

Emergency policy:

- Homework should be submitted by 5 pm on or before the designated dates. Turn in the homework at the instructor's mailbox in the physics department. Late homework will not be graded.
- When missing exams, no points will be given. Make-up exams may be possible if a 24 hour in-advance notice is submitted and the instructor approves it. In that case, a weight of .8 will be applied to the make-up exam score to calculate the exam score.
- You should submit your original work for homework and exams.

Course expectations:

- Prior to class, you will be required to read assigned chapter sections.
- During class, you will be engaged in small group discussions or Predict-Observe-Explain (POE) activities.
- During class and homework, you will be exposed to various visualizations and simulations that can help develop mental models of important ideas.

To test yourself whether you understand a new material, ask the following:

- (EXPLAIN) Can I explain it in my own words?
- (CIRCUMSCRIBE) Can I elaborate criteria for when and where to use the material and why?
- (TRANSFER) Can I apply it to other situations that require the use of the material?
- (QUESTION) Can I ask new questions related to the material?

Tentative Course Schedule

Week	Lecture number	Date	Physics Topic	Textbook chapter	HW due
1	1	1/7, T	Quantum: Schrodinger equations for bound and unbound states	Review: C5 and C6	
	2	1/9, Th	Atomic: Schrodinger equations in (x, y, z) and (r, θ, ϕ) coordinates	C7.1-7.2 C7.4	
2	3	1/14, T	Atomic: Hydrogen atom in (r, θ, ϕ) coordinates Atomic: (l, m_l) orbital quantization	C7.5-7.6	
	4	1/16, Th	Atomic: Hydrogen atom radial solutions Atomic: Hydrogen like atoms Atomic: Photon emission rules	C7.3 C7.7-7.8 C7.10	HW1: 01/17, Fri
3	5	1/21, T	Atomic: L and S quantization Atomic: Multielectron atoms and periodic table	C8.1-8.3 C8.4	
	6	1/23, Th	Atomic: Adding angular momenta Atomic: Angular momentum under magnetic field	C8.6-8.7 C8.8-8.9	HW2: 01/27, Mon
4	7	1/28, T	Mid-term I		
	8	1/30, Th	Statistics: Classical and quantum statistics	C9.1-9.4	
5	9	2/4, T	Statistics: Fermi distribution and examples	C9.5-9.6	
	10	2/6, Th	Statistics : Bose-Einstein distribution and examples Statistics: Specific heat	C9.7-9.9	HW3: 02/07, Fri
6	11	2/11, T	Sold state: Molecules, rotation, and vibration	C10.1-10.3	
	12	2/13, Th	Solid state: Crystals and energy bands Solid state: Conduction	C10.4-6	
7	13	2/18, T	Solid state: Semiconductor theory and devices Solid state: Superconductor	C10.7-9	HW4: 02/19, Wed
	14	2/20, Th	Mid-term II		
8	15	2/25, T	Nuclear: Nuclei models	C11.1-11.3	
	16	2/27, Th	Nuclear: Radioactivity	C11.5-11.6	
9	17	3/4, T	Nuclear: Nuclear reactions	C11.7	
	18	3/6, Th	Elementary: Fundamental particles and detection	C12.1-12.3	HW5: 03/07, Fri
10	19	3/11, T	Elementary: Fundamental interactions Elementary: Standard model	C.12.4-12.5	
	20	3/13, Th	Elementary: Parity, charge conjugation, and time reversal	C12.6-12.7	HW6: 03/14, Fri
Final		3/19, W	Final Exam, 8-11 am		