

Course Syllabus

PHYS 3740/ECE 3740

Introduction to Quantum Mechanics and Relativity

Lecture: MW 1:25-2:45 PM, WEB L105

Discussion: F 2:00-2:50 PM, WEB L105

Course Description

This course will provide an overview of the Physics of the 20th century. This is essentially the first material that is required for a Physics degree that includes modern physics.

Students will learn special relativity and have an introduction to quantum mechanics. They will also study the physics of nuclei, scattering, and the funny behavior that differentiates quantum mechanical particles from the more intuitive, macroscopic motion that we see with our own eyes. We will also discuss the history behind the scientific progress in modern physics and modern applications that arise from these discoveries. The class will emphasize group problem solving and the ability to qualitatively describe the behavior behind the equations.

Instructor

Douglas Bergman

230 INSCC (Bldg 19), 801-585-5973, bergman@physics.utah.edu (<mailto:bergman@physics.utah.edu>)

Office hours: M 3-4, T 11-12.

TA

Chris Winterowd

205-5B INSCC (Bldg 19), u0678934@utah.edu (<mailto:u0678934@utah.edu>).

Textbook

Modern Physics 2nd Edition, Randy Harris,

Pearson Addison-Wesley, ISBN-10: 0-8053-0308-1, ISBN-13: 978-0-80530308-7

also

 [Special Relativity \(Hogg\).pdf](#) ▾

Course Structure

There will be two lecture class periods per week (MW) with an additional discussion section (F) covering homework topics. The lecture class periods will primarily but not strictly lecture; they may also include problem solving, simulations, demonstrations, and other interactive techniques and the mix will vary depending on the needs of the students. Students are expected to read the assigned material before coming to lecture. Questions from all members of the class are encouraged and expected.

Homework

There will be 12 homework assignments over the course of the semester. These will be posted by Wednesday and due the following Wednesday at the beginning of class. Homework will be graded on a scale of 0-10. Late assignments will be accepted but will have one point deducted for each day late.

Exams

There will be two midterms, to be administered during the Friday discussion section time and in the lecture room. These will be given on 2/27 and 4/24. There will be no makeup midterms. The midterms will be open-book, open-note tests. However, no electronic devices other than calculators will be allowed.

The final will be comprehensive. It will also be a open-book, open-note test, and no electronic devices other than calculators will be allowed.

Feedback

There is a standing survey in the "Quizzes" section where students can anonymously voice concerns to the instructor.

Fulfilments

This course satisfies the General Education Quantitative Intensive (QI) requirement. This course addresses the following Essential Learning Outcomes: Critical Thinking, Written Communication, Foundations and Skills for Lifelong Learning.

ADA Statement

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.

Rights & Responsibilities

All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies proscribed conduct (Article XI) that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code carefully and know they are responsible for the content. According to Faculty Rules and Regulations, it is the faculty responsibility to enforce responsible classroom behaviors, and I will do so, beginning with verbal warnings and progressing to dismissal from and class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee.

Weekly Schedule

Weeks 1-3 (1/12-28): Special Relativity

Week 4-7 (2/2-25): Wave/Particle Duality

Week 7 (2/27): **Exam 1**

Week 8-9 (3/2-11): Schrödinger's Equation

Week 10-13 (3/23-4/8): Quantum Mechanics in 3D/Atomic Physics

Week 13-14 (4/13-22): Quantum Statistical Mechanics














Week 14 (4/24): **Exam 2**















Week 15 (4/27): Cosmic Rays
















Course Summary:

Date

Details

Mon Jan 12, 2015	 Class 1: Relativity (https://utah.instructure.com/calendar?event_id=678779&include_contexts=course_320512)	1:25pm to 2:45pm
Wed Jan 14, 2015	 Class 2: Space-time diagrams (https://utah.instructure.com/calendar?event_id=678781&include_contexts=course_320512)	1:25pm to 2:45pm
Wed Jan 21, 2015	 Class 3: Lorentz Transformation (https://utah.instructure.com/calendar?event_id=678782&include_contexts=course_320512)	1:25pm to 2:45pm
	 Homework 1 (https://utah.instructure.com/courses/320512/assignments/1974998)	due by 2:45pm
Mon Jan 26, 2015	 Class 4: Relativistic dynamics (https://utah.instructure.com/calendar?event_id=678783&include_contexts=course_320512)	1:25pm to 2:45pm
Wed Jan 28, 2015	 Class 5: Relativistic dynamics (https://utah.instructure.com/calendar?event_id=678784&include_contexts=course_320512)	1:25pm to 2:45pm
	 Homework 2 (https://utah.instructure.com/courses/320512/assignments/1975019)	due by 2:45pm
Mon Feb 2, 2015	 Class 6: Planck's hypothesis (https://utah.instructure.com/calendar?event_id=678840&include_contexts=course_320512)	1:25pm to 2:45pm
Wed Feb 4, 2015	 Class 7: Photons (https://utah.instructure.com/calendar?event_id=678884&include_contexts=course_320512)	1:25pm to 2:45pm
	 Homework 3 (https://utah.instructure.com/courses/320512/assignments/1975021)	due by 2pm
Mon Feb 9, 2015	 Class 8: Atomic spectra (https://utah.instructure.com/calendar?event_id=678922&include_contexts=course_320512)	1:25pm to 2:45pm
Wed Feb 11, 2015	 Class 9: Bohr Model (https://utah.instructure.com/calendar?event_id=678923&include_contexts=course_320512)	1:25pm to 2:45pm
	 Homework 4 (https://utah.instructure.com/courses/320512/assignments/1975028)	due by 2pm
	 Class 10: DeBroglie's hypohthesis (https://utah.instructure.com/calendar?)	1:25pm to 2:45pm

Wed Feb 18, 2015	 Homework 5 (https://utah.instructure.com/courses/320512/assignments/1975033)	due by 2:45pm
Mon Feb 23, 2015	 Class 11: Heisenberg (https://utah.instructure.com/calendar?event_id=678946&include_contexts=course_320512)	1:25pm to 2:45pm
Wed Feb 25, 2015	 Class 12: Review (https://utah.instructure.com/calendar?event_id=678947&include_contexts=course_320512)	1:25pm to 2:45pm
	 Homework 6 (https://utah.instructure.com/courses/320512/assignments/1975039)	due by 2:45pm
Fri Feb 27, 2015	 Midterm 1 (https://utah.instructure.com/courses/320512/assignments/2111234)	due by 2pm
Mon Mar 2, 2015	 Class 13: Schödinger Equation (https://utah.instructure.com/calendar?event_id=678956&include_contexts=course_320512)	1:25pm to 2:45pm
Wed Mar 4, 2015	 Class 14: Bound states (https://utah.instructure.com/calendar?event_id=678957&include_contexts=course_320512)	1:25pm to 2:45pm
Mon Mar 9, 2015	 Class 15: Expectation values (https://utah.instructure.com/calendar?event_id=678959&include_contexts=course_320512)	1:25pm to 2:45pm
Wed Mar 11, 2015	 Class 16: Scattering (https://utah.instructure.com/calendar?event_id=678960&include_contexts=course_320512)	1:25pm to 2:45pm
	 Homework 7 (https://utah.instructure.com/courses/320512/assignments/1975071)	due by 2:45pm
Mon Mar 23, 2015	 Class 17: Schrödinger Equation in 3D (https://utah.instructure.com/calendar?event_id=678997&include_contexts=course_320512)	1:25pm to 2:45pm
Wed Mar 25, 2015	 Class 18: Angular equation (https://utah.instructure.com/calendar?event_id=678998&include_contexts=course_320512)	1:25pm to 2:45pm
	 Homework 8 (https://utah.instructure.com/courses/320512/assignments/1975093)	due by 2:45pm
	 Class 19: Radial equation (https://utah.instructure.com/calendar?)	1:25pm to 2:45pm

Mon Mar 30, 2015	 event_id=679003&include_contexts=course_320512	
Wed Apr 1, 2015	 Class 20: Spin (https://utah.instructure.com/calendar?event_id=679004&include_contexts=course_320512)	1:25pm to 2:45pm
	 Homework 9 (https://utah.instructure.com/courses/320512/assignments/1975116)	due by 2:45pm
Mon Apr 6, 2015	 Class 21: Pauli Exclusion Principle (https://utah.instructure.com/calendar?event_id=679425&include_contexts=course_320512)	1:25pm to 2:45pm
Wed Apr 8, 2015	 Class 22: Periodic Table (https://utah.instructure.com/calendar?event_id=679426&include_contexts=course_320512)	1:25pm to 2:45pm
	 Homework 10 (https://utah.instructure.com/courses/320512/assignments/1975120)	due by 2:45pm
Mon Apr 13, 2015	 Class 23: Atomic Spectra (https://utah.instructure.com/calendar?event_id=679427&include_contexts=course_320512)	1:25pm to 2:45pm
Wed Apr 15, 2015	 Class 24: Boltzmann Distribution (https://utah.instructure.com/calendar?event_id=679428&include_contexts=course_320512)	1:25pm to 2:45pm
	 Homework 11 (https://utah.instructure.com/courses/320512/assignments/1975123)	due by 2:45pm
Mon Apr 20, 2015	 Class 25: Bose-Einstein & Fermi-Dirac (https://utah.instructure.com/calendar?event_id=679429&include_contexts=course_320512)	1:25pm to 2:45pm
Wed Apr 22, 2015	 Class 26: Review (https://utah.instructure.com/calendar?event_id=679450&include_contexts=course_320512)	1:25pm to 2:45pm
	 Homework 12 (https://utah.instructure.com/courses/320512/assignments/1975127)	due by 2:45pm
Fri Apr 24, 2015	 Midterm 2 (https://utah.instructure.com/courses/320512/assignments/2111237)	due by 2pm
	 Participation (https://utah.instructure.com/courses/320512/assignments/2048603)	due by 2:45pm
Mon Apr 27, 2015	 Class 27: Cosmic Rays (https://utah.instructure.com/calendar?event_id=679471&include_contexts=course_320512)	1:25pm to 2:45pm

Wed May 6, 2015



Final Exam

(<https://utah.instructure.com/courses/320512/assignments/2111238>)

due by 1pm
