PY 351 Modern Physics
Syllabus
Fall Term 2018

Instructor: Claudio Rebbi
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Office hours: Mo 11:00AM-12:00PM, We 2:30PM-3:30PM, Th 3:30PM-4:30PM, and by appointment

Goal of this course is to teach the basics aspects of modern physics (relativity, quantum mechanics, statistical mechanics etc.), at a level appropriate for students who intend to major in physics. Emphasis is also placed on the historical developments which led to the foundation of modern physics.

Class meetings: Lecture: TR 2:00PM-3:15PM, room PSY B33
Discussion sessions:
D1, We 12:20PM-1:10PM, PRB 146
D2, We 1:25PM-2:15PM, PRB 146
Lab sessions:
L1, Mo 12:30PM-3:15PM, SCI B11
L2, Mo 6:30PM-9:15PM, SCI B11

Teaching assistant: Abhishek Som
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Office hours (in SCI 121): Mo 4:15PM-5:15PM, Fr 12:00PM-1:00PM, and by appointment

Learning assistant: Salvatore Pace
e-mail: space20@bu.edu
Office hours (in SCI 121): Tu 5:00PM-6:00PM, Fr 1:00PM-2:00PM, and by appointment


Required lab notebook: bound quadrille notebook, 60 pages - 5x5 Quad
Tentative Schedule of Lectures

9-4 Introduction, survey of particles and forces
9-6 Survey of particles and forces
9-11 Notions of statistical mechanics
9-13 Distribution functions
9-18 Black-body radiation, Planck’s constant
9-20 Atomic spectra, the Bohr model
9-25 Special relativity
9-27 Special relativity
10-2 Make-up and Review
10-4 First midterm exam
10-9 no class - Monday schedule of classes
10-11 Wave properties of particles, the uncertainty principle
10-16 Rutherford scattering
10-18 The Schrödinger equation
10-23 One dimensional systems: square-well potential
10-25 One dimensional systems: potential barriers and tunneling
10-30 Make-up and Review
11-1 Second midterm exam
11-6 Meaning of the wave-function: operators, the uncertainty principle revisited
11-8 The quantum harmonic oscillator
11-13 The Schrödinger equation in three dimensions
11-15 Angular momentum
11-20 Spin, Pauli’s exclusion principle
11-22 no class -Thanksgiving Day
11-27 The hydrogen atom
11-29 Notions of atomic physics
12-4 Quantum statistics
12-6 Quantum statistics
12-11 Make-up and Review

Note: Attendance at lectures and discussion sessions is mandatory. Students who cannot attend should justify their absence by sending an email message, before the class they will miss if at all possible, to rebbi@bu.edu for the lectures or the appropriate teaching assistant for the discussions.
Schedule of Laboratories

Sept. 17  Millikan oil drop - room SCI B11
Oct. 1   Photoelectric effect - room SCI B11
Oct. 15  Electron diffraction - room SCI B11
Oct. 29  Atomic spectra - room SCI 130
Nov. 12  Atomic excitation potentials - room SCI B11

Note: All laboratories must be completed for passing the course.

Schedule of Exams

10-4, 2:00PM-3:20PM, room PSY B33  1st midterm exam
11-1, 2:00PM-3:20PM, room PSY B33  2nd midterm exam
12-18, 3:00PM-5:00PM, room PHO 211  final exam

Homework assignments

Homeworks will be distributed weekly and will be due in class one week after they have been assigned.
Readings and non-graded short assignments will also be given out.

Grading

At the end of the course the scores for homework assignments, laboratory reports, midterm exams and final exam will be averaged with two independent set of weights, as follows:
a) homework 25%, labs 15%, 1st midterm 20%, 2nd midterm 20%, final 20%;
b) homework 25%, labs 15%, 1st midterm 10%, 2nd midterm 10%, final 40%;
and each student will be given the greater of the two scores.

Rationale: The set of weights a) is meant to encourage the students to study regularly during the course and to come to midterms well prepared. The set of weights b) is offered as an alternative to give students who had a slow start but are able to catch up, or students who had a bad day during one of the midterms, the possibility of making up with a good final exam.

In addition, up to 5 points will be given and added to the overall score (not to exceed 100) for class participation. Class participation includes returning the non-graded short assignments, attending discussion sessions, coming to office hours, returning well written assignments and lab reports, etc.
Letter grades will then be assigned to the average score $S$ as follows:

- $93 \leq S \leq 100$: A
- $88 \leq S < 93$: A-
- $83 \leq S < 88$: B+
- $78 \leq S < 83$: B
- $73 \leq S < 78$: B-
- $68 \leq S < 73$: C+
- $63 \leq S < 68$: C
- $55 \leq S < 63$: C-
- $45 \leq S < 55$: D
- $S < 45$: F

Addendum

This addendum addresses further standard questions that students may have about the course.

1. Required readings: students are expected to read and study the relevant sections of the textbook. Students should also do any additional assigned reading.

2. Web site: syllabus, assignments, and other relevant material can be found at http://physics.bu.edu/~rebbi.

3. Late work: homework assignments must be returned by the deadline stated in the assignment. Extensions may be requested by sending an email message to the instructor only for very serious reasons (grave illness, etc...). Barring emergencies, the request for an extension must be sent before the deadline.

3. Independence of work: students should do their homework assignments by themselves.

4. Students’ responsibility: Students should know and understand the provisions of the CAS Academic Conduct Code. (Copies are available in room CAS 105). Cases of suspected academic misconduct will be referred to the Dean’s Office.