

Syllabus for Modern Physics Physics 251 and 252, Fall 2017

[Aug 15th: this is a preliminary version: expect some changes before start of lectures]

Lecture Instructor:

- Prof. Giacinto Piacquadio
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Recitation instructors:

- Prof. Marivi Fernandez-Serra
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- Prof. Rosalba Perna
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Text (required):

1. "Special relativity (The M.I.T. Introductory Physics Series), A.P. French
2. "Quantum physics of Atoms, Molecules, Solids, Nuclei, and Particles", Robert Eisberg, Robert Resnick
3. "A practical Guide to Data Analysis for Physical Science Students", L. Lyons

Course URL: Will be announced

Note: Classes (lectures, labs, recitations) start during the week of 08/28 to 09/01

- First Lab (all sessions): Monday 08/28 1pm
- First Lecture: Tuesday 08/29 12pm
- First recitation, R01: Monday 08/28 12pm, R02: Wednesday 08/30 12pm

PHY 251/252 Course Topics

Introduction to Data Analysis

Special relativity

1. Lorentz transformations
2. Relativistic Kinematics
3. Relativistic Dynamics – collisions and conservation laws

The Quantum Theory of Light

1. Black-body radiation
2. The photoelectric effect
3. The Compton Scattering

The Wavelike Properties of Particles

1. Matter waves
2. The wave-particle duality
3. The Heisenberg uncertainty principle

Quantum Mechanics and Atomic Structure

1. The Rutherford-Bohr model of atom
2. Schrödinger equation
3. One-electron atom, hydrogen energy levels
4. Multi-electron atoms

Quantum statistics

1. Bose-Einstein statistics
2. Fermi-Dirac statistics

Solids – conductors and Semiconductors

1. Types of solids
2. Band theory of solids
3. Electrons in metals
4. Semiconductors, superconductivity

Nuclear physics

1. Properties of nuclei
2. Nuclear models
3. Radioactive α , β , γ decays

Particle Physics

1. Fundamental forces, elementary particles, conservation laws
2. The Quark Model
3. The Standard Model and beyond

Course rules

Homework: every week, 1 week to turn in. No credit for late homeworks. Any (serious!) excuses (medical or otherwise) are to be documented and discussed with the instructor in a timely manner. Homeworks must be turned in by the date and time on the assignment, typically during a lecture period. If you cannot make the lecture, you can

bring your assignment to the instructor's office before the due date/time. Students are encouraged to work together, but everybody should produce their own write-up (copies will be disqualified).

Quizzes: 10 minutes long, every 2 weeks **at the beginning of the recitation session**. Don't be late!

Exams: There will be 2 midterms and 1 final exam (final exam covers the whole course material). Midterm exams will be given during the regular lecture hours.

Lab reports: 1 week to turn in. No credit for late lab reports. One (1) lab report with the lowest score will be dropped from the total lab score. All reports (with all sections completed) must be turned in (no exception!). **Missing reports (one or more) will result in an F grade.** Any (serious!) excuses (medical or otherwise) are to be documented and discussed with the instructor in a timely manner. Everybody should produce his or her own report (**copies will be disqualified**).

PHY 252 (the Lab) is a separate course from PHY 251, but students earn a common grade in PHY 251 and PHY 252. PHY 252 is required and must be taken concurrently with PHY 251.

Labs:

- Michelson interferometer
- The photoelectric effect
- Measurement of e/m for electrons
- Measurement of the Electron Charge
- Particle/radiation scattering
- Bragg scattering of microwaves
- Emission spectrum of hydrogen
- Part A: The Geiger Counter
- Part B: Radioactive decays
- Dynamic of Elementary Particles

GRADING

Your final PHY251/PHY252 course grade will be determined by weighting the various portions of the course as follows:

- 5% quizzes
- 20% midterm exams (10% each midterm)
- 20% homework
- 30% final exam
- 25% lab

In order to pass the course you need at least grade C. Grade C- or lower means you will have to repeat the course (as required for all undergraduate courses for Physics majors).

Grades

- Weighted average: 90% - 100% → grade A
- Weighted average: 85% - 90% → grade A-
- Weighted average: 80% - 85% → grade B+
- Weighted average: 70% - 80% → grade B
- Weighted average: 65% - 70% → grade B-
- Weighted average: 60% - 65% → grade C+
- Weighted average: 50% - 60% → grade C
- Weighted average: 45% - 50% → grade C-
- Weighted average: 40% - 45% → grade D+
- Weighted average: 35% - 40% → grade D
- Weighted average: <35% → grade F

Graders

- Quizzes, Midterms – prof. Fernandez-Serra, prof. Perna, prof. Piacquadio
- Final exam – prof. Piacquadio
- Homework: Teaching Assistant
- Lab reports: Teaching Assistants

Religious holidays

If the schedule of homeworks, exams or other assignments is in conflict with your religion's Holidays, please let me know in an email by the end of the first week of instructions and I will do my best to accommodate your needs. Please note that I cannot make changes in the course schedule after the first week of classes. No consideration will be made if someone approaches me in this matter at a time close to the due date or the exam date.

Americans With Disability Act

If you have a physical, psychological, medical or learning disability that may impact your ability to carry out assigned course work, contact the staff in the Disabled Student Services office (DSS), 128 Educational Communications Center, 632-6748/9. DSS will review your concerns and determine with you what accommodations are necessary and DSS will advise me. All information and documentation of disability is confidential.

University Academic Integrity Statement

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the [academic judiciary website](http://www.stonybrook.edu/uaa/academicjudiciary/) at: <http://www.stonybrook.edu/uaa/academicjudiciary/>

Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts

their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.