

**Syllabus for Modern Physics  
Physics 251 and 252, Fall 2015**

**Lecture Instructor:**

Prof. Joanna Kiryluk

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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", R. Eisberg and R. Resnick
3. "A Practical Guide to Data Analysis for Physical Science Students", L. Lyons

**Course URL:** <http://skipper.physics.sunysb.edu/~joanna/Lectures/PHY-251-252/>

**PHY251/252 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. Schrodinger equation
3. One-electron atom, hydrogen energy levels
4. Multielectron 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. Radioactivity,  $\alpha$ ,  $\beta$  and  $\gamma$  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 weeks to turn it in. **No credit for late homework.** Students are encouraged to work together, but write up should be their own (copies will be disqualified). Any (serious!) excuses (medical or otherwise) are to be documented and discussed with the instructor in a timely manner.

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

**Exams:** There will be one midterm and a final exam (final exam covers **the whole** course material). A midterm exam will be given during the regular lecture hours.

**Lab reports:** 2 weeks to turn it in. **No credit for late lab reports. All reports must be turned in (no exception!)** Any (serious!) excuses (medical or otherwise) are to be documented and discussed with the instructor in a timely manner. Students must prepare their own reports. Copies will be disqualified. Penalty for missing reports (negative points).

**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 taken concurrently with PHY 251.**

## GRADING

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

- 5% quizzes
- 20% midterm exam
- 15% homework
- 40% final exam
- 20% 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. This is Physics Department / University rule, not J. Kiryluk's rule (check with the undergrad office, if in doubt).

Guaranteed grades (grades can be higher than listed below, slight curving is possible):

- Weighted average: 85 % - 100 % grade A
- Weighted average: 70 % - 85 % grade B
- Weighted average: 55 % - 70 % grade C
- Weighted average: 40 % - 55 % grade D

Note: grades A-, B+, B-, C+, C-, D+, D- will be given.

**GRADERS:**

- Midterm, Final - J. Kiryluk
- Quizzes: R01: TBD, R02 and R03: J. Kiryluk
- Homework: Y..Zhang
- Lab reports: H. Niederhausen, J. Stachurska

**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 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.