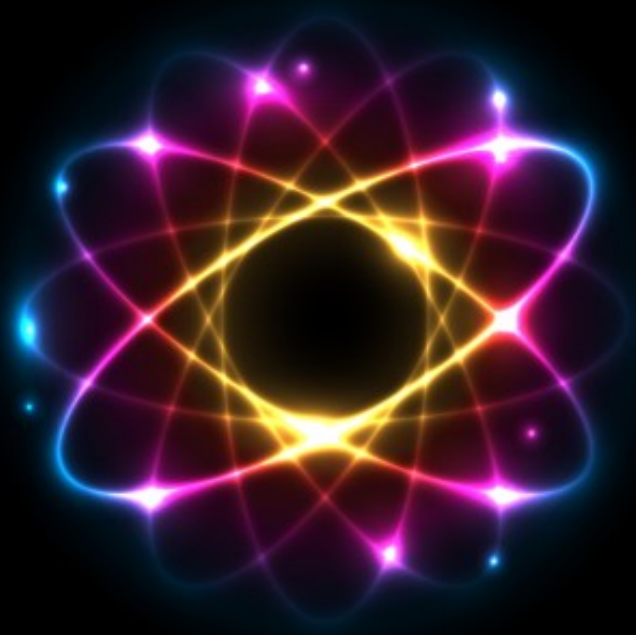
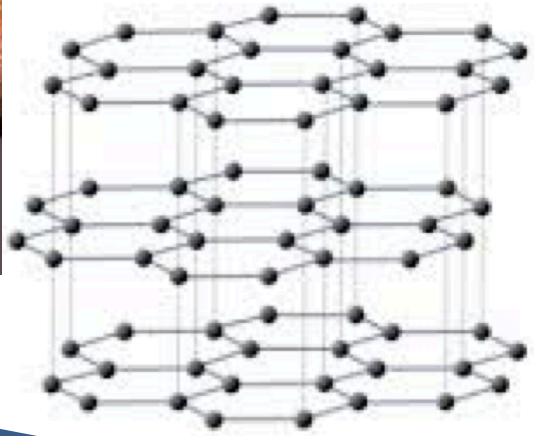
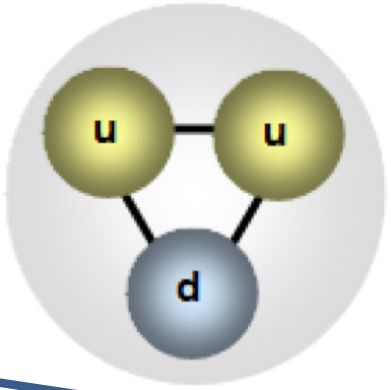
PHYS 2210 Quantum Physics 1

What is Quantum Physics?



Physics at different length scales





10^{27}

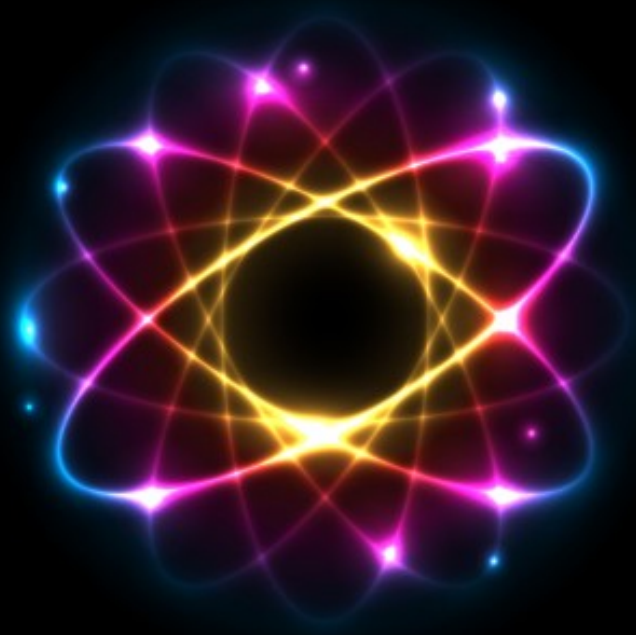
10^{0}

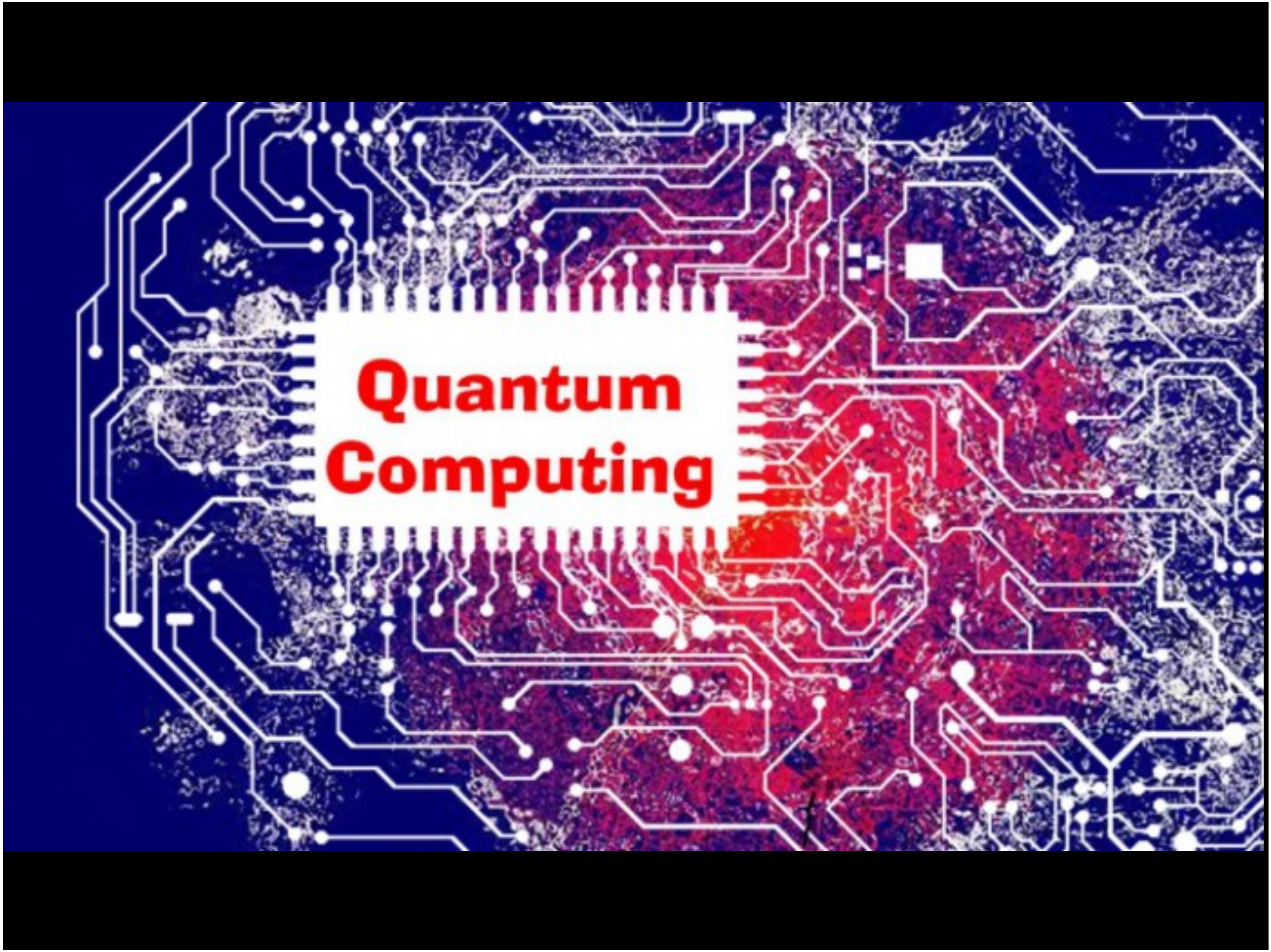
10^{-9}

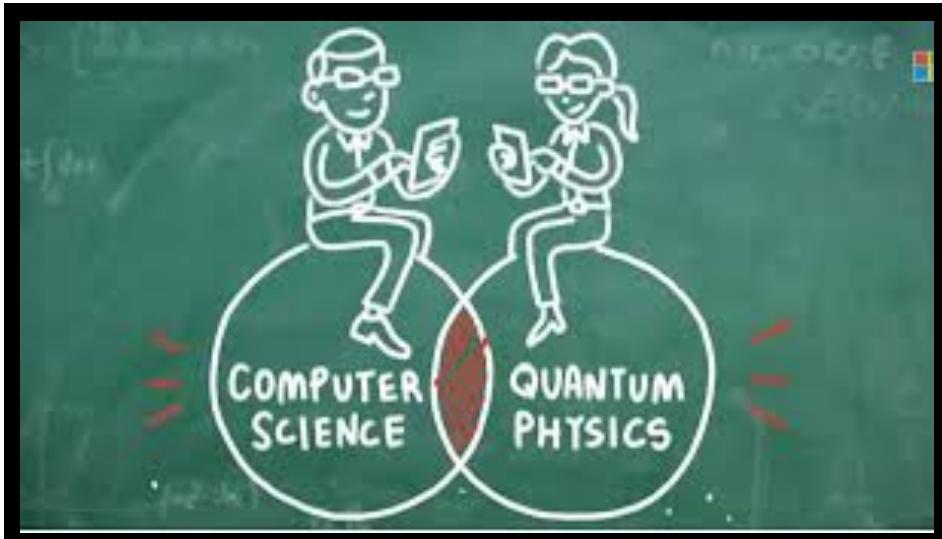
10^{-15}

length scale [m]

Why Quantum Physics?




Quantum
Computing


COMPUTER SCIENCE
QUANTUM PHYSICS


Google


Microsoft


IBM Q


DARPA


NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

PHYS 2210 Quantum Physics I, Spring of 2020

INSTRUCTOR: Trevor David Rhone; office: CII 4137; email: rhonet@rpi.edu;

Office Hours: Tuesday 1pm to 2pm, in CII 4137

TAs' OFFICE HOURS:

Graduate TA: Leaf Swordy (swordl@rpi.edu); HBH J-Rowl, Wednesday, 12-1pm

Undergrad Facilitator(s): Zuzanna Jedlinska; Resnick J-Rowl, Wednesday, 2-3pm

TEXTBOOK: "Quantum Physics: A Fundamental Approach to Modern Physics", John Townsends, First Edition. University Science books.

PREREQUISITE: PHYS 1200 (Physics II) or PHYS 1250 (Honors Physics II), MATH 1020 (Calculus II).

LOCATION & TIME:

J-Rowl 2C13; Tuesday and Friday, 10:00-11:50 am

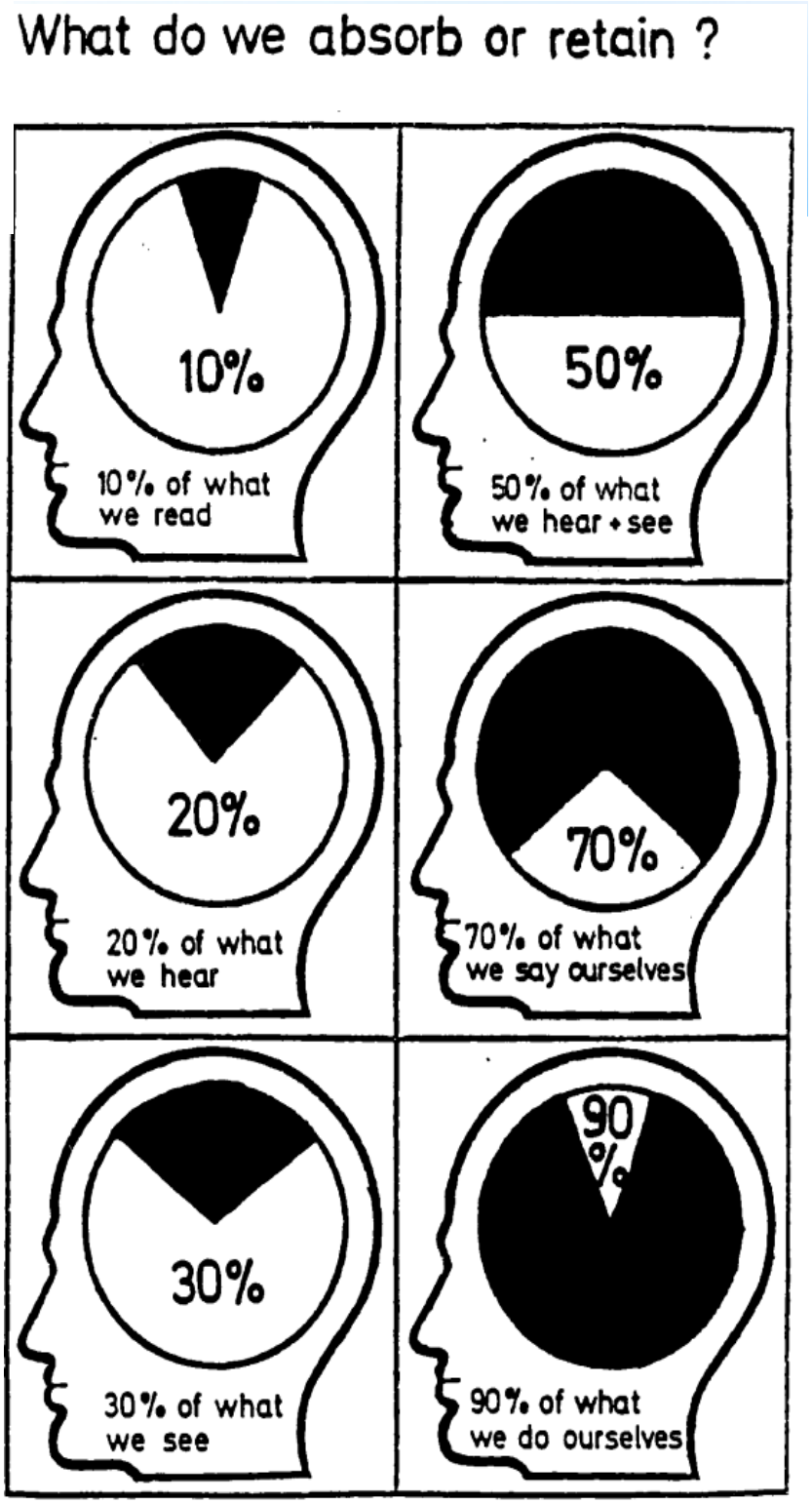
COURSE FORMAT

The course combines lectures with in-class discussion and assignments.

Interactive Learning Is Not a New Idea:

It Is a Method By Which We Maximizes Our Ability to Absorb Information.

Edgar Dale:
Audio-visual Methods in Teaching,
Holt, Rinehart, and Winston (1969)



Instructor biosketch: Trevor Rhone (CII 4137)

Tel: x8655, email: rhonet@rpi.edu

2019-2020: RPI Physics Department, Assistant Professor

Area of research: Materials Informatics
(Artificial intelligence + Materials science)

Research Group Webpage:
https://materials-intelligence.com/

2015-2019: Postdoctoral Fellow at Harvard University

2012-2015: Postdoctoral research at NTT Basic Research Labs

In-class assignments: students will use loose leaf notebook to do the in-class assignments and hand them in after each class

TAs' duties:

Zuzanna Jedlinska: will discuss solutions of in-class assignments during each lecture; conduct review sessions before each exams.

Leaf Swordy: will collect and grade homework assignments on Tuesdays and give them back the next Tuesdays; discuss homework solutions in class on Tuesdays***

***Homework due dates posted at LMS

Exam schedule:

Exam dates:

- 02/21
- 03/31
- 04/28

Exam room location: classroom

Review sessions:

- Conducted by TAs and facilitators
- Before the exam during office hours

GRADING POLICY

- Three exams.
- Attending classes is required.
- No late Homework.
- Homework must reflect the student's own ability and effort.
- Discussions with classmates and TAs are good.
- Work copied from solution book or similar resources will not be graded.

- Homework assignments: 10%
  - (assigned each week, see schedule for due date)
- In-class problems: 20% (due at the end of each class)
- Exam-1: 20% (02/21/2020, class time)
- Exam-2: 20% (03/31/2020, class time)
- Exam-3: 30% (04/28/2020, class time)

Letter Grade Assignments

A	92-100
A-	90-91.99…
B+	87-89.99…
B	82-86.99…
B-	80-81.99…
C+	77-79.99…
C	72-76.99…
C-	70-71.99…
D+	67-69.99…
D	60-66.99…
F	<60

ACADEMIC INTEGRITY STATEMENT

Student-teacher relationships are built on trust. The Rensselaer Handbook of Student Rights and Responsibilities defines various forms of Academic Dishonesty and you should make yourself familiar with these. In this class, all assignments that are turned in for a grade must represent the student's own work. Students are encouraged to collaborate on homework but must write up solutions independently. Students may not copy or paraphrase homework solutions obtained from the internet, textbooks, or any other sources. DON'T COPY SOMEONE ELSE'S HOMEWORK, AND DON'T CHEAT ON EXAMS. A single instance of cheating will result in a failing grade for the course. If you have any question concerning this policy before submitting an assignment, please ask for clarification.

Reference materials for complex numbers

Nigel DaSilva's slides and problems

Schaum's Outline of Complex Variables, 2ed (Schaum's Outlines) 2nd Edition

by **Murray R Spiegel**, **Seymour Lipschutz**, **John J. Schiller Jr.**, **Dennis Spellman**

McGraw-Hill Education
(June 10, 2009)

Syllabus: (posted in LMS)

1. Math Background I
2. Math background II
3. Wave nature of light
4. Particle nature of light
5. Wave nature of matter
6. Schrodinger Equation
7. Wave packets
8. Expectation values
9. Particle in a box
10. Functional vector space
11. Exam 1
12. Energy eigenvalue problems
13. Simple harmonic oscillators
14. Finite potential wells
15. Scattering from stepped potentials
16. Quantum tunneling
17. Quantum postulates
18. Commutation relationships
19. 3D problems
20. Exam 2
21. Angular momentum
22. Spherical harmonics
23. Hydrogen atom
24. Zeeman effect
25. Intrinsic spins
26. More on quantum mechanics