

# PHY122 — Electricity and Magnetism

September 3<sup>rd</sup>, 2014

## Introduction to the course

# Goals of the course

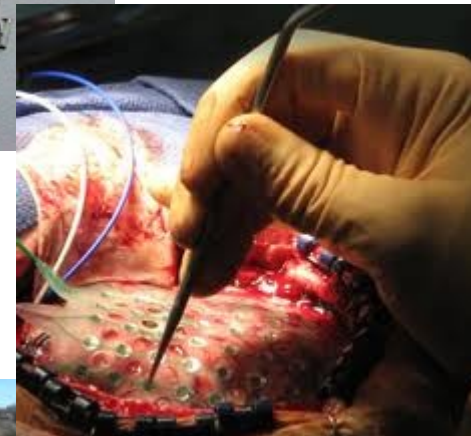
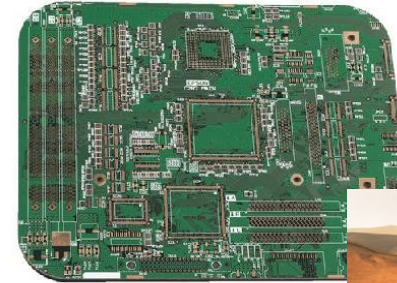
- ▶ PHY122 is a survey course for physics and engineering majors
- ▶ Principles of **electromagnetism** and their importance in our world
- ▶ Topics to be covered:
  - Electric fields and potentials, conductivity, dipoles, capacitors, RC circuits, magnetic fields, magnetic materials, induction, transformers, generators, LRC circuits, AC circuits, Maxwell equations, electromagnetic waves, relativity...
- ▶ Level: **calculus-based** introductory university level
- ▶ Quantitative course: individual work and exams will focus on **problem solving**, very similar to PHY121
- ▶ Pre-requisites:
  - PHY101: Basic Math Assessment → PHY121
  - MATH143 or 162 or equivalent

# Challenges of the course

- ▶ Nearly zero direct experience with E&M in everyday life
  - For scientists and engineers, though, E&M is everywhere
- ▶ A lot of NEW concepts
  - Each with different consequences
  - Concepts are interrelated
  - Problems in textbook and homework, workshops, examples in lecture clarify these
- ▶ PHY122 is much harder than PHY121 in math!
  - Math is the language of physics, and we will use it!
  - Vectors: components, dot and vector products
  - Multivariate calculus: line, surface integrals, gradients
  - Symmetries: multivariate problems  $\rightarrow$  one variable

# Why should you be here?

- ▶ Pretty much every device we use these days is electric/electronic
  - Radio, communications, wireless, antennas
  - Circuits, heat dissipation, electric consumption
  - Computing, faster chips, robotics, actuators
  - Biomedicine, chemical bonds, imaging
  - Energy: transportation, alternative sources, engines
- ▶ You have studied gravity (and mechanics), now it's turn to study the other main force in Nature that is relevant to everyday life
- ▶ A basic understanding of the principles of E&M is a necessary tool for engineers and scientists
- ▶ Furthermore, the capability to determine whether solutions to problems make sense is a skill that you all need to have



# Who we are

## ▶ Prof. Aran Garcia-Bellido

- Particle Physicist: research at Fermilab and CERN
- M.Sc. Madrid (1999), PhD Royal Holloway University of London (2002), postdoc with U. of Washington, joined UR faculty in 2008
- B&L 406, (585) 276 3422, [aran@pas.rochester.edu](mailto:aran@pas.rochester.edu)
- Office hours: Mon, 3-4 pm & Wed, 3.30-5 pm
- For any registration issues: changes in workshop, enrollment, etc... contact Janet Fogg (B&L 211, Mon-Fri 12:30-2:00pm)

## ▶ Teaching Assistants: Christopher Mullarkey, Gonzalo Diaz, Jonathan Curtis, Christina Loniewski, James Maslek, Mark Christman, Molly Finn, John Kauppi

## ▶ SPS tutoring: 7-9pm in POA library, begins Sep 22

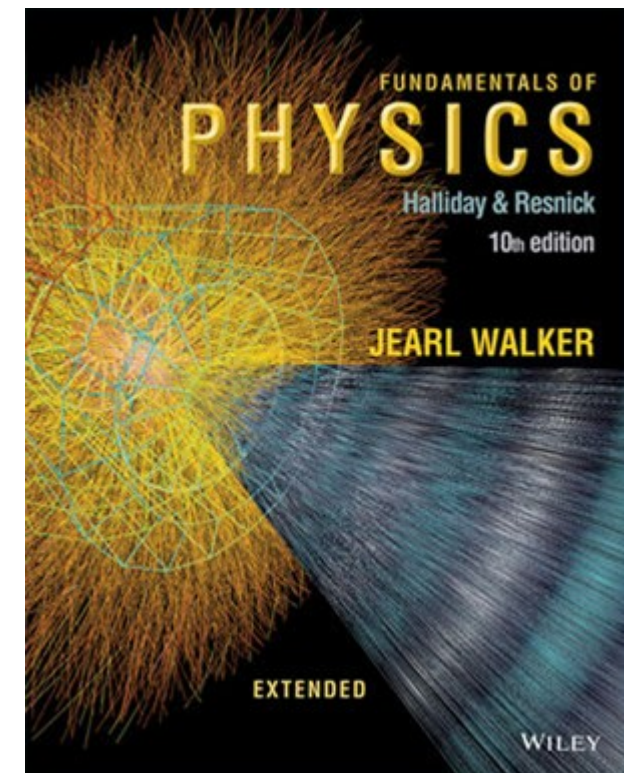
## ▶ Lab coordinator:

- [physlabs.em@pas.rochester.edu](mailto:physlabs.em@pas.rochester.edu)
- They operate separately from me, so write to them directly if you have any questions/needs

# Course info

- ▶ Textbook: “Fundamentals of Physics” 10<sup>th</sup> edition, Halliday, Resnick, Walker (Wiley 2014), chapters 21-41
  - ISBN: 9781118894095 (softcover)
  - Use textbook to read material and as source of additional problems, quizzes
  - Not needed for homework or workshops
  - Alternatively: Giancoli, “Physics for Scientists and Engineers”, 4<sup>th</sup> edition (vol. 2)
- ▶ We will use **BlackBoard** for distributing course materials, making announcements, etc...
- ▶ Info will be updated regularly: check the Syllabus/Calendar tab!
- ▶ Discussion board is available: ask your questions there so that others benefit as well

PHY122





# Components 1: Lectures

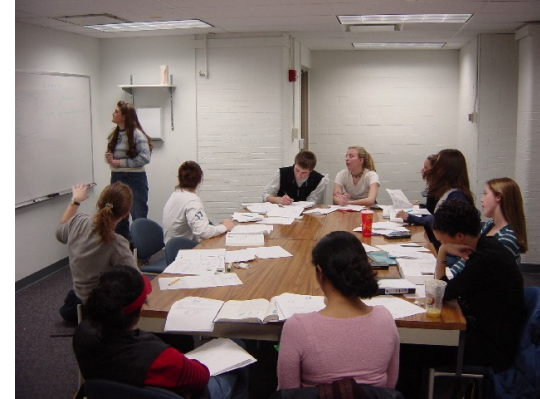
- ▶ Focus on the concepts and interconnections of the material
- ▶ No substitute for reading the textbook!
- ▶ **Read the chapter before the lecture: attempt a few conceptual questions, think about the basics**
- ▶ Ask questions during lecture
- ▶ Notes will be available just after each lecture
- ▶ Will use lab demos, quizzes and conceptual questions during the lecture
- We will use the CPS Pulse Personal Response System (PRS) for in-class quizzes and concept tests
- Make sure you acquire one, and participate in class
- It is crucial that you enter your student ID:
  - Click Menu > cycle to “Student ID” > press enter
  - Erase current ID > enter yours > press enter
  - Prompt to reenter > enter again > press enter



# Components 2&3: workshops & problems

## ► Workshops:

- Use study modules and solve problems to fix the ideas: learn from fellow students
- Come prepared, ask the TAs, discuss amongst you, make sure you understand steps
- Will cover previous and current week lectures
- **Attendance to workshop correlates with better grades: do participate!**



## ► Homework problems:

- **Absolutely critical for your survival in this course**
- Struggle with them and make sure you understand the solutions and solving techniques to do well in this course
- Due each **Saturday by 5pm: First is due September 13<sup>th</sup>!**
- Solutions will be posted the following days
- Put in TA boxes in B&L first floor, next to the entrance to the tunnels



# Components 4: labs

- ▶ Give you a hands-on experience with making measurements and interpreting data
- ▶ They are not run by us, but are **required to get a grade in this course**
- ▶ **You have to do all 5 labs and hand in the reports**
- ▶ Print out lab manual in advance, read it and complete pre-lab homework: you will hand it in just before the lab starts
- ▶ You will be contacted with more specific info by the lab instructors: begin on **September 9<sup>th</sup>**
- ▶ Information, manuals, etc... at <http://www.pas.rochester.edu/~physlabs>



# Grading

Scheme	Exam1	Exam2	Exam3	Probs+prelabs +workshop attendance+ PRS quizzes	Final Exam
<b>1</b>	0%	22%	22%	15%	41%
<b>2</b>	22%	0%	22%	15%	41%
<b>3</b>	22%	22%	0%	15%	41%

- ▶ Three midterm exams (Oct 2, Oct 28, Nov 17 at 8 am, Hubbell Auditorium) and the final (Dec ?? Hubbell Auditorium)
- ▶ The lowest exam grade (or a missed exam) will be dropped: sets the scheme for your final grade: keep scheme with highest value
- ▶ Homework problems (8%), lab grades (including prelabs, 1%), workshop attendance (5%) and PRS quizzes (1%) will weigh 15% of your final score
- ▶ Completed labs are a requirement: no grade without them
- ▶ Only one problem (chosen at random) from the homework problems will be graded each week, the rest will be graded for effort
- ▶ The two lowest homework problem sets will not be counted
- ▶ Workshop attendance is counted (but you can miss a couple)
- ▶ No grading on a curve, letter grade will be assigned at the end of course

# Final advice

## ► How to succeed in PHY122:

- Do required reading before class: summary, concepts, tests
- Do the homework problems (and understand the solutions)
- Attend the workshops and participate in them: do more problems
- Keep up with the class: ask questions, form a study group,...

- We are here to help you learn this material, but it is up to you to actually master it!
- Ask questions during class!
- Ask any of us for help as soon as you don't understand something (come to office hours, discussion board, after class, email)
- We require handing in of the problem sets and attendance to the workshops to encourage keeping up
- Do not fall behind! Before you do, ask for help!
- Physics does not cram easily!
- Make sure you know how to solve problems before the exam