



PHYS121 Integrated Science-Physics

Changcheng Zheng 郑昌成

changcheng.zheng@dukekunshan.edu.cn;

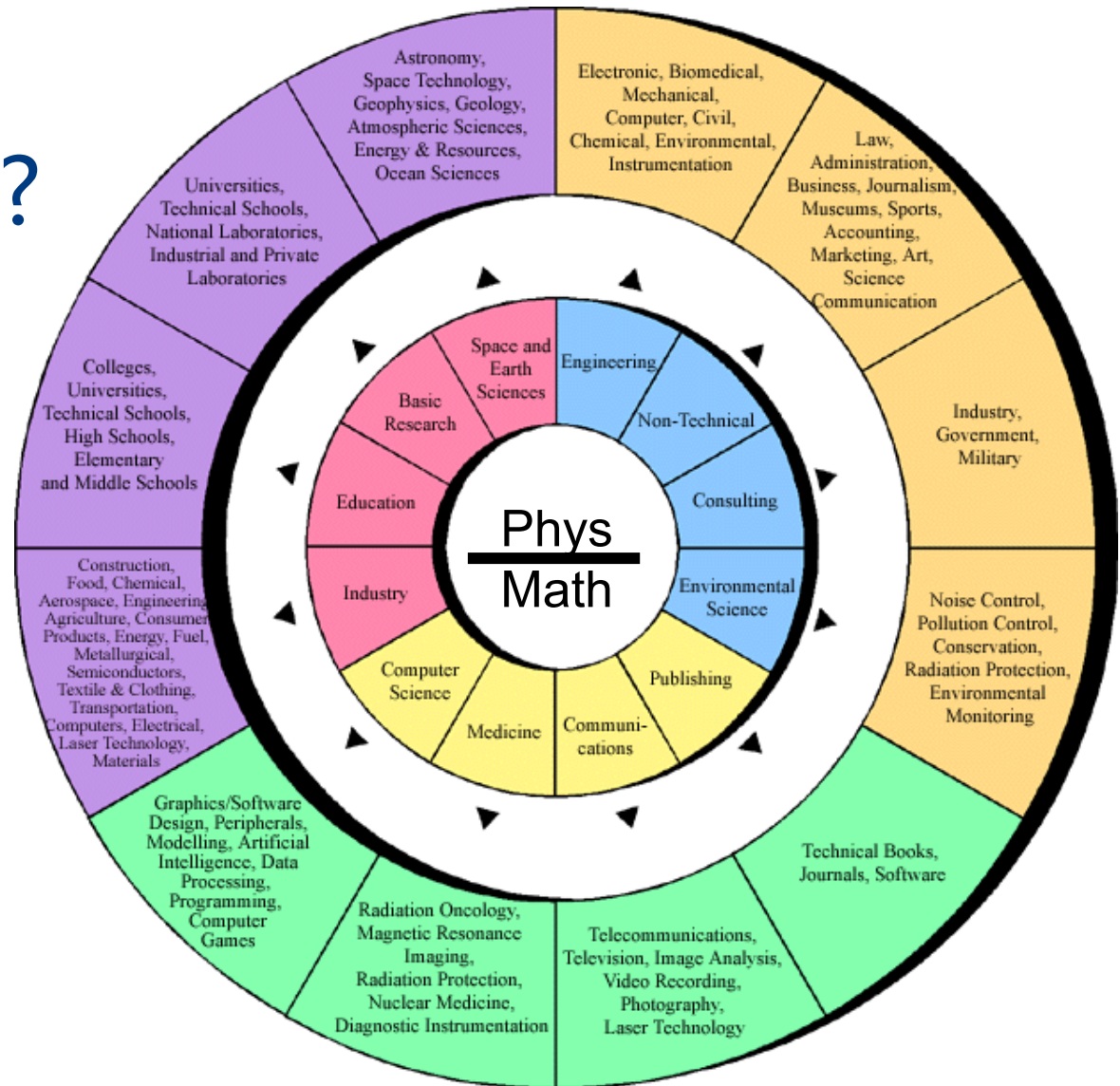
Office: WDR3012; Research lab.: WDR1202.





Why Physics?

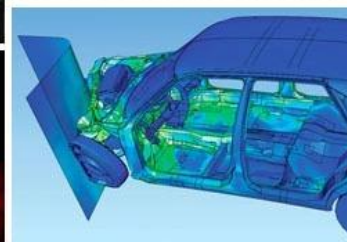
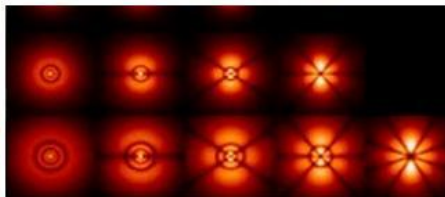
Foundation of
modern science
and
technology—
modern life





Why Physics?

- Physics is Everywhere



Laser: Light Amplification by Stimulated Emission of Radiation



Optical Characterization Lab





“What is physics? To me — growing up with a father and mother who were both physicists — physics was not subject matter. The atom, the troposphere, the nucleus, a piece of glass, the washing machine, my bicycle, the phonograph, a magnet — these were all incidentally the subject matter. The central idea was that the world is understandable.... Physics was a point of view.”

In 2014, John Hopfield looked at the state of condensed matter physics, the field in which he’d spent a very fruitful early part of his career before turning to the area that would win him the Nobel. ([Annual Review of Condensed Matter Physics | 31 min read](#))



What you will learn in this course

1. Demonstrate the capability of discovery-based learning through questioning and verifying the established theoretical framework with experiments.
2. Write solutions to problems in a manner that clearly displays the reasoning leading to precisely specified answers.
3. Collaborate and communicate effectively on the reasoning process.
4. Implement the core concepts of physics (mechanics) in understanding, predicting and controlling complex systems (such as chemical and biological systems) surrounding us.



Brief course plan

- W1: Kinematics and Newton's laws;
- W2: Dynamics and Gravitation;
- W3: Midterm exam*, Linear momentum and Rotation;
- W4: Oscillation and Wave;
- W5: Rigid body and Fluid;
- W6: Thermodynamics;
- W7: *integrated topics, review.

Class meeting time: MoTuWeTh. 10:00-11:15 AM.



What you will do

- 1) Background-knowledge readings and pre-class test (quizzes).
- 2) Be here! (What will I do here?)
- 3) In-class Q&A and group discussion, etc.
- 4) Homework (Gradescope).
- 5) Lab (organized by Mr. Kai Wang) reports (Gradescope) and a DIY lab presentation/report.
- 6) Midterm exam (week 3/4?)
- 7) Final exam (week 8).

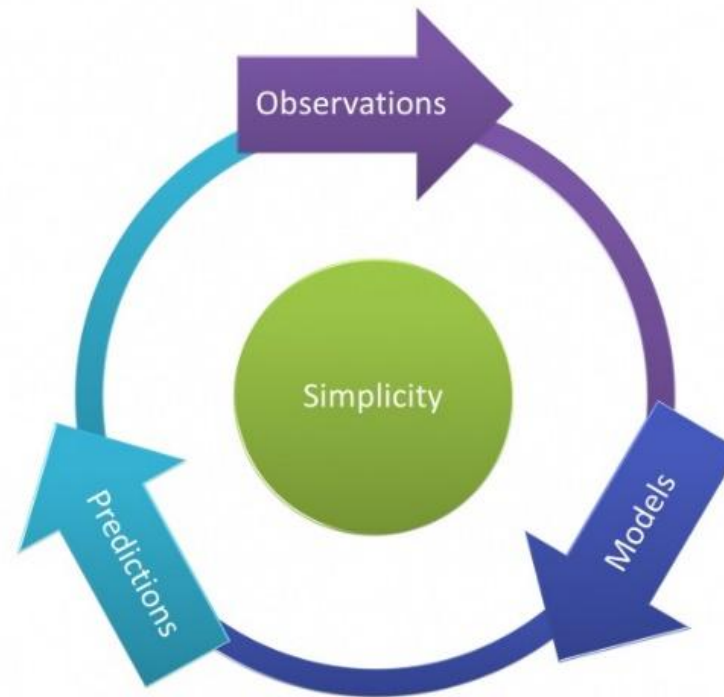


Assessment methods

ACTIVITIES	PERCENT AGES	DETAILS
Quizzes	10%	Multiple-choice questions and others
Homework	20%	Weekly, submitted to Gradescope (bonus from recitation?).
Lab	15%	1 mini lab+1 training lab+2 full lab reports
Presentation	8%	Report and presentation about a DIY lab or research topic.
Midterm exam	15%	TBA (week 3/4)
Final exam	32%	TBA



The Scientific Method



- Begin with a set of observations.
- Create a model to explain the observations.
- Make testable predictions using the model.
- Compare the predictions to new observations.
- Use the comparison to assess and modify the model.
- Repeat as required.

Simplicity selects one preferred model from the many possible models that describe any set of observations.



Some tips about how to learn this course

Read the textbook and make use of the online resources.

Practice.

Keep in pace.

Read the lab instruction, play with PhET, do the lab and write the report.

Ask question and raise your concerns.

Take a quick look of all assignments when they are released!

Physics is fun, enjoy learning it!



Once a physicist



How has physics helped you in your career?

I think physics gives you a mental framework for problem solving. It also teaches you to be willing to admit you're wrong.



How has your physics background been helpful in your work, if at all?

I am continuously underestimated by people, and the physics degree is like a golden ticket. Once people know I studied physics it's like they see me as a completely different person. This is why I often encourage women to study science. I get taken seriously. It also gives me permission to make content about science, which I love.



How has your physics background been helpful in your work, if at all?

It has been a *massive* help. Fundamentally, it taught me the power of putting trust in logical, mathematical thinking that takes you all the way from first principles to the final conclusions they imply. My physics tutors at Oxford taught us that above all else, and it stuck.

http://www.iop.org/careers/working-life/profiles/page_57833.html



Questions

