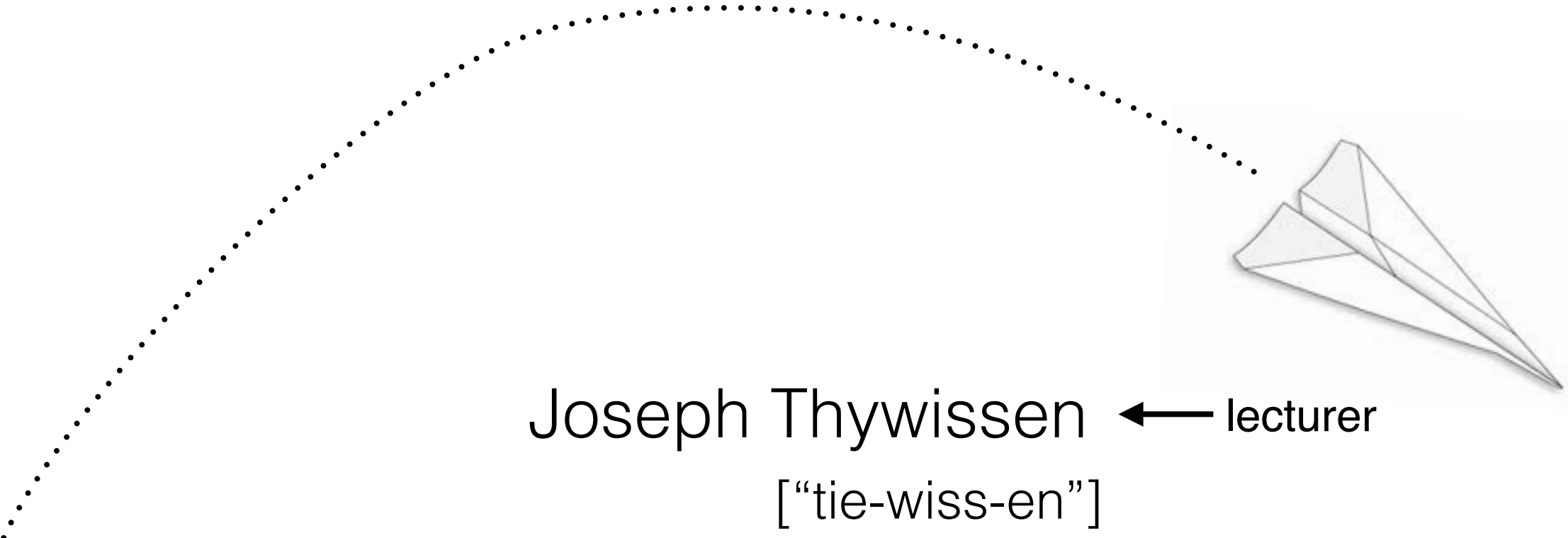


PHY180

Classical Mechanics

(aka Elements of Physics I)



Joseph Thywissen ← lecturer
[“tie-wiss-en”]

Brian Wilson ← labs, tutorials

What is Classical Mechanics?

Study of motion and its causes

$$\vec{F} = \frac{d}{dt} m \vec{v}$$

You may have studied mechanics in high school, but now:

- Calculus based
- Advanced topics
 - Harmonic motion, rotating objects
- Not an historical perspective
 - Start from conservation laws, not $F=ma$

“Why study Classical Mechanics?”

- Conceptual building block
 - ✦ mechanics underpins many topics in engineering
 - ✦ starting point for quantum physics and more
- 1st physical theory that you may encounter
 - ✦ sophisticated mathematical structure
 - ✦ testing theory experimentally
 - ✦ distinction between postulates and derived relations
 - ✦ abstraction and beauty: conservation laws, symmetry
- Learning how to think:
 - ✦ how to solve problems
 - ✦ learn hypothesis-testing
 - ✦ new perspective on the world around you

Mathematics and the world around us

“Can I write an equation for that?”

-why should math work?

-can math describe everything?

....hired for this skill!

Falsifiable

-Physicist: someone who loves being proven wrong

-Experiments cannot indicate truth, only false

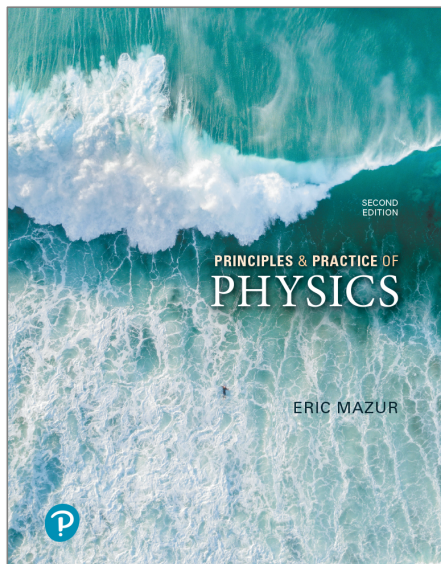
-How sure are you of what you think you know?
(uncertainty is quantifiable)

-Do an experiment

Engineering Science is for the “Yes, but why?” students.

—K.B. Jackson, Chair of Engineering Physics from 1942–63

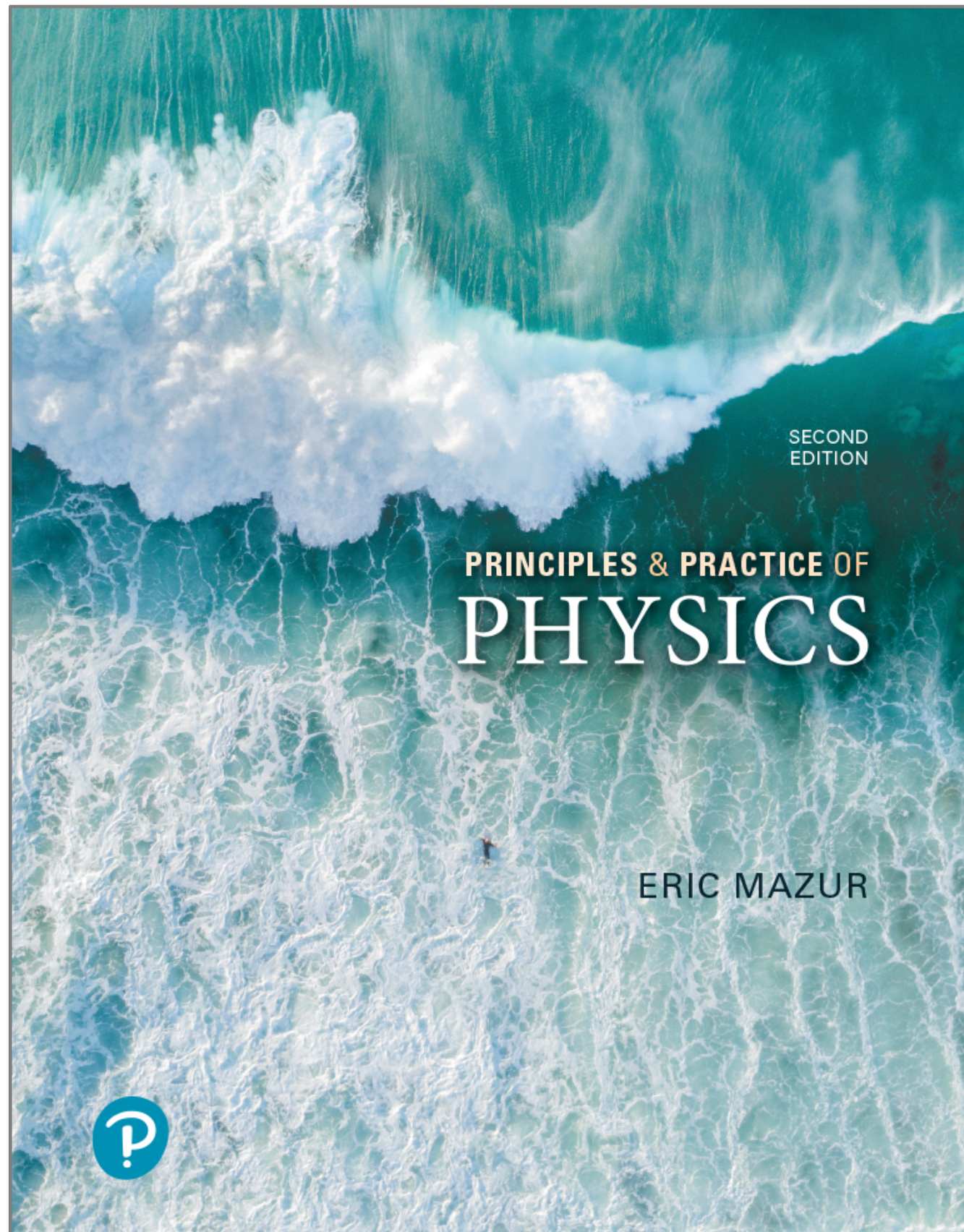
Course structure



- Homepage: Quercus q.utoronto.ca/
 - ◆Pre-recorded lecture videos
 - ◆Documents such as slides, solutions, etc.
 - ◆Lab report submission
 - ◆where you can see your grades
 - ◆links to other 2 sites:

- Communication: Piazza
 - piazza.com/utoronto.ca/fall2020/phy180
 - ◆Online discussion forum
 - ◆All physics questions (to profs and TAs)
 - ◆Direct messaging for Prof. Thywissen
(*instead of email, use this please*)

- Text: “MyLab and Mastering” site
 - ◆ebook: *Principles & Practice of Physics*
 - ◆assigned problem sets
 - ◆practice problems & study aids
 - ◆how to: <https://tinyurl.com/y569myu7>



Read your
amazing
textbook!

Module I

CHAPTER 1 Foundations 1

- 1.1 The scientific method 2
- 1.2 Symmetry 4
- 1.3 Matter and the universe 6
- 1.4 Time and change 8
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- 1.6 Physical quantities and units 14
- 1.7 Significant digits 17
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- 1.9 Developing a feel 24

CHAPTER 2 Motion in One Dimension 35

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- 2.2 Position and displacement 37
- 2.3 Representing motion 39
- 2.4 Average speed and average velocity 41
- 2.5 Scalars and vectors 46
- 2.6 Position and displacement vectors 48
- 2.7 Velocity as a vector 52
- 2.8 Motion at constant velocity 53
- 2.9 Instantaneous velocity 55

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- 3.1 Changes in velocity 69
- 3.2 Acceleration due to gravity 70
- 3.3 Projectile motion 72
- 3.4 Motion diagrams 74
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- 3.6 Free-fall equations 81
- 3.7 Inclined planes 84
- 3.8 Instantaneous acceleration 85

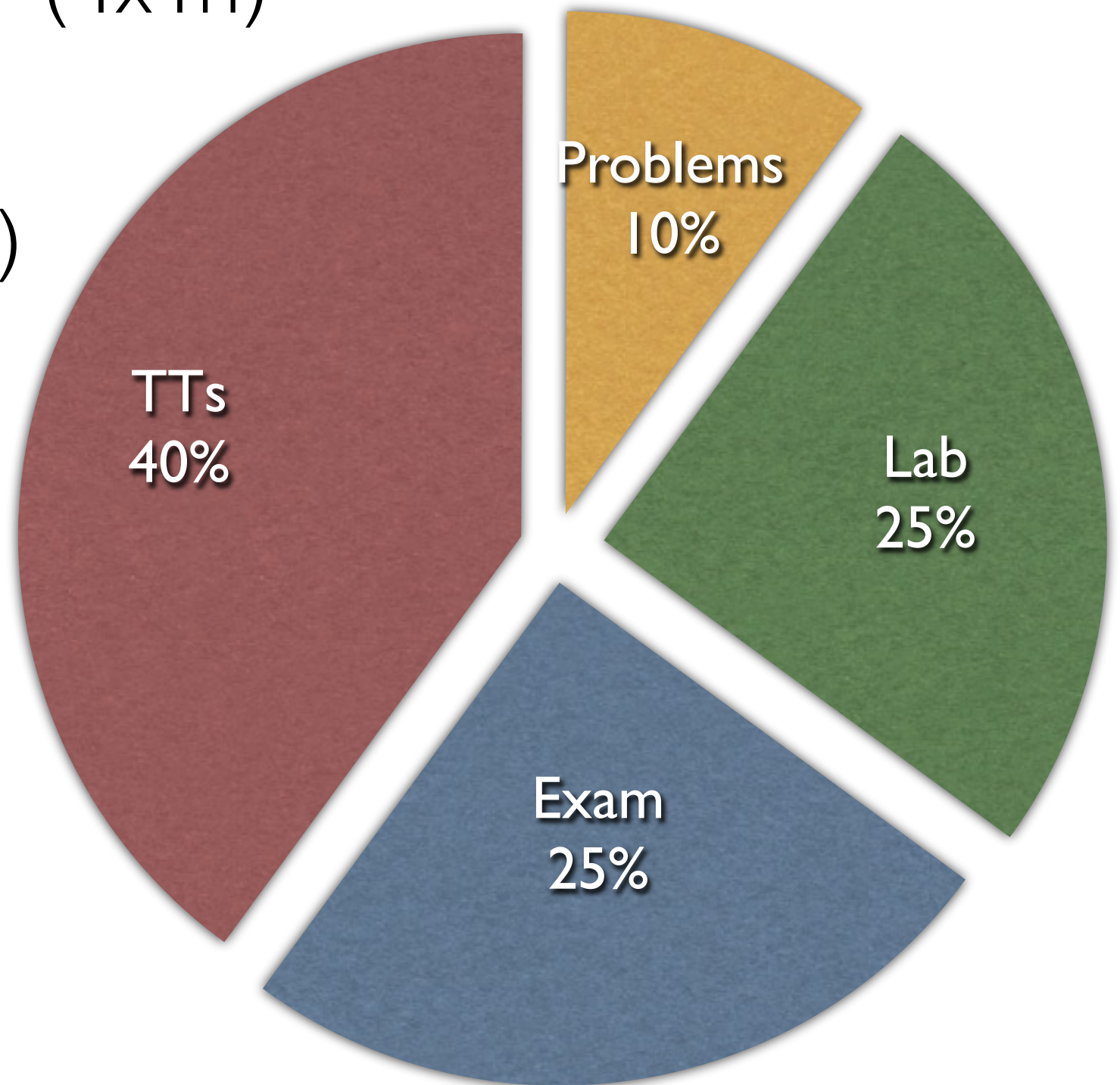
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- 4.2 Inertia 99
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- 4.5 Inertial standard 109
- 4.6 Momentum 110
- 4.7 Isolated systems 112
- 4.8 Conservation of momentum 117

wk	Topic	Mazur Readi ng	<u>Sun</u>	<u>Mon</u>	<u>Tue</u>	<u>Wed</u>	<u>Thu</u>	<u>Fri</u>	<u>Sat</u>	
0	Introduction	Ch. 1	06-Sep	07-Sep	08-Sep	09-Sep	10-Sep Course Intro	11-Sep	12-Sep practice PS due (no marks)	
1	Motion, Acceleration	Chs. 2,3	13-Sep	14-Sep Ch2 Q&A; Tutorials	15-Sep Ch2,3 Q&A	16-Sep	17-Sep Ch3 Q&A	18-Sep PS due on Ch2,3	19-Sep	
2	Momentum	Ch. 4	20-Sep	21-Sep Ch3 Q&A; Tutorials	22-Sep Practice Test Ch3,4 Q&A	23-Sep Lab Report due 8am	24-Sep Ch4 Q&A	25-Sep PS due on Ch4	26-Sep	
3	Energy	Ch. 5	27-Sep	28-Sep review Q&A; Tutorials	29-Sep 9am Test on Module 1	30-Sep	01-Oct Ch5 Q&A	02-Oct PS due on Ch5	03-Oct	
4	Reference frames	Ch. 6	04-Oct	05-Oct Ch5,6 Q&A; Tutorials	06-Oct Ch5,6 Q&A	07-Oct	08-Oct Ch6 Q&A	09-Oct PS due on Ch6	10-Oct	
5	Interactions	Ch. 7	11-Oct	12-Oct Thanksgiving holiday!	13-Oct Ch6,7 Q&A	14-Oct Lab Report due 8am	15-Oct Ch7 Q&A	16-Oct PS due on Ch7	17-Oct	
6	Force	Ch. 8	18-Oct	19-Oct review Q&A; Tutorials	20-Oct 9am Test on Module 2	21-Oct	22-Oct Ch8 Q&A	23-Oct PS due on Ch8	24-Oct	
7	Work	Ch. 9	25-Oct	26-Oct Ch8 Q&A; Tutorials	27-Oct Ch8,9 Q&A	28-Oct Lab Report due 8am	29-Oct Ch9 Q&A	30-Oct PS due on Ch9	31-Oct	
8			01-Nov	02-Nov review Q&A; Tutorials	03-Nov 9am Test on Module 3	04-Nov	05-Nov (no class)	06-Nov	07-Nov	
			08-Nov	09-Nov	10-Nov	11-Nov	12-Nov	13-Nov	14-Nov	
			Fall Break!							

PHY180 marking:

- 40% Term “Testlets” (4x1h)
- 10% Problem sets
- 25%: Lab (at home)
- 25%: Exam (2h)



“What do I do now?”

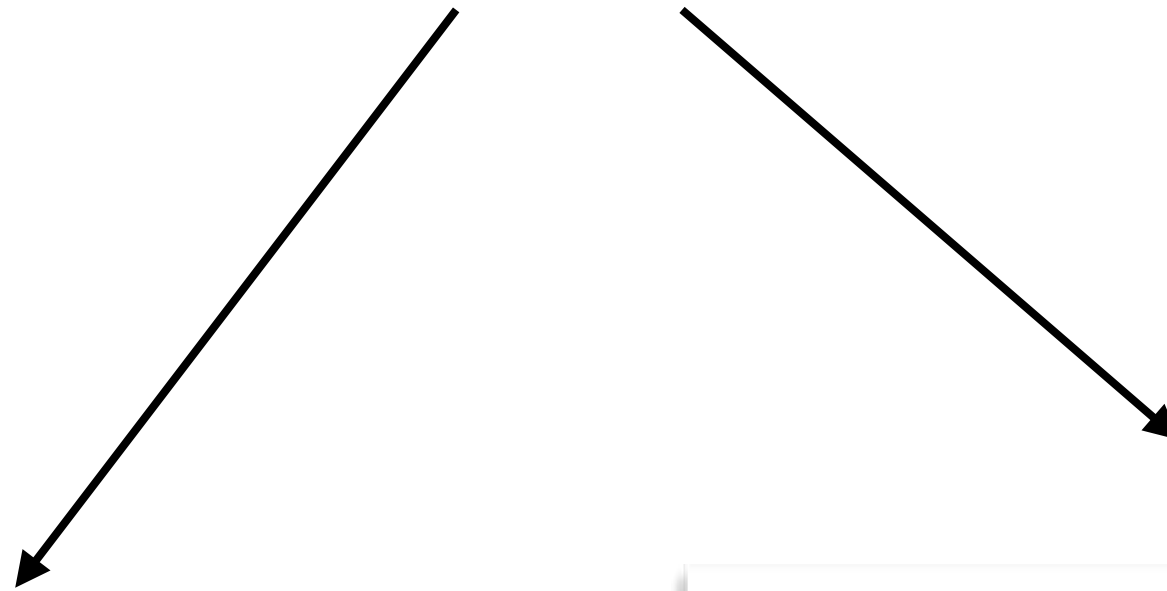
First week in PHY180

- Setup your tools (textbook; Piazza login)
- Read Chapters 1-3 in textbook
- Watch recorded lectures
- Work problem sets online to practice
- Ask q's in "PRA" (tutorial) and "LEC" (Q&A)
- Start your lab

First deliverables:

- Problem set on Ch 1, Sat 12 Sept (no mark)
- Problem set on Ch 2&3, Friday 18 Sept
- Lab report 1 on Wednesday 23 Sept

Questions?



ask on forum

<u>Mon</u>	<u>Tue</u>	<u>Wed</u>	<u>Thu</u>
07-Sep	08-Sep	09-Sep	10-Sep
			Course Intro
14-Sep	15-Sep	16-Sep	17-Sep
Ch2 Q&A; Tutorials	Ch2,3 Q&A		Ch3 Q&A

ask during class