

Lectures: Physics 3306

Provides an introduction to a wide variety of topics in classical (pre-quantum) physics as a bridge to prepare students for subsequent upper-level courses in physics. The topics covered include thermodynamics, fluid mechanics, mechanical waves, optics, radiation, electromagnetic phenomena, atoms, and laboratory techniques. Prerequisites: C- or better in PHYS 1106; and in PHYS 1304 or PHYS 1308.

Who am I?



- I joined Southern Methodist University as an Assistant Professor in the fall of 2024
- I am building my new group and recruiting a postdoc and students
- I work on the **ATLAS** experiment
- My experiment is at CERN
- My research interests lie in multiboson physics, polarization measurements and effective field theories
- I am also interested in studying event generators on GPUs and contributing to ATLAS upgrades

Labs

Lectures

Schedule

No class

Month	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
January	19	20	21	22	23	24	25
	26	27	28	29	30	31	1
February	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	1
March	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
April	30	31	1	2	3	4	5

Labs

Lectures

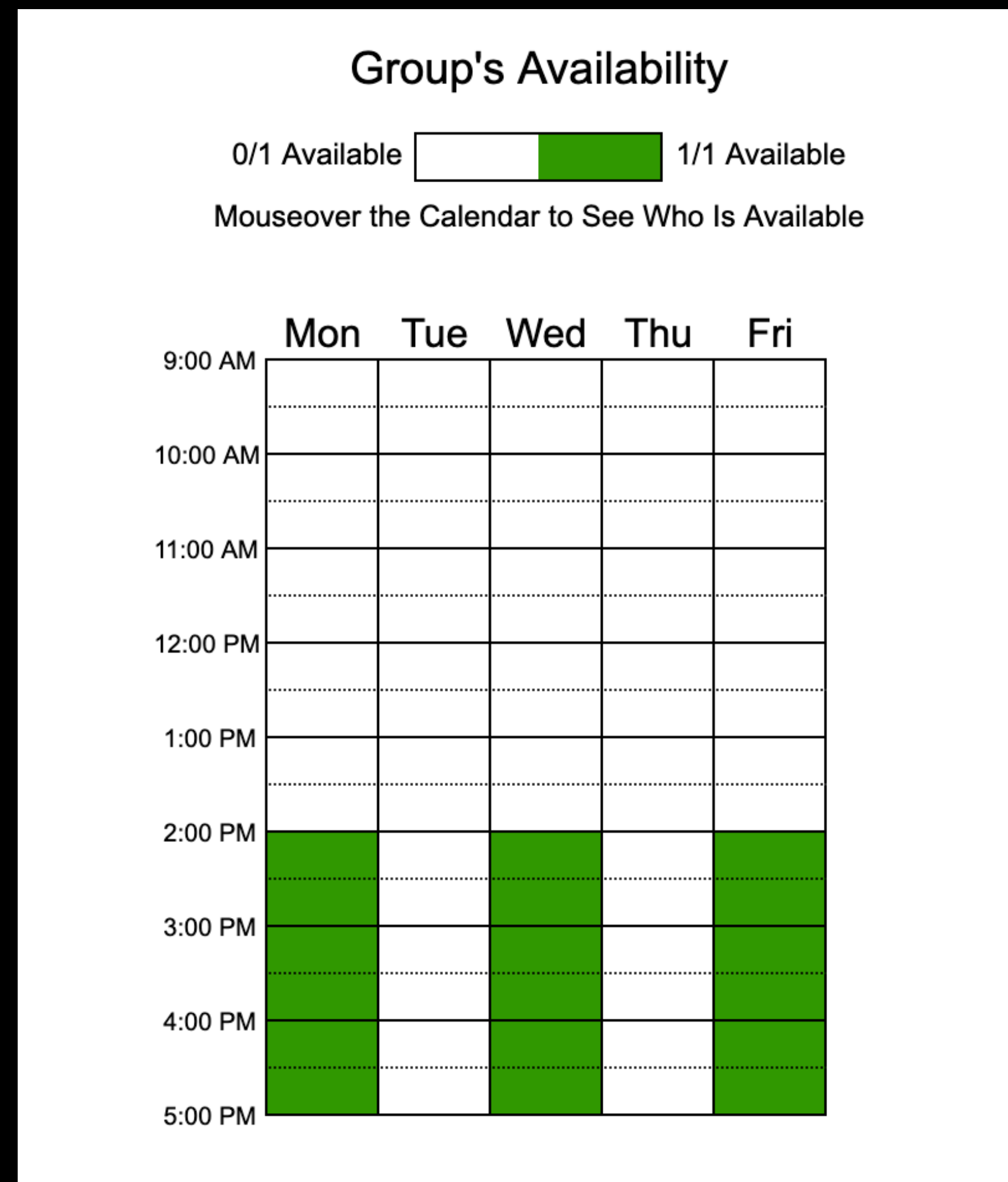
Schedule

No class

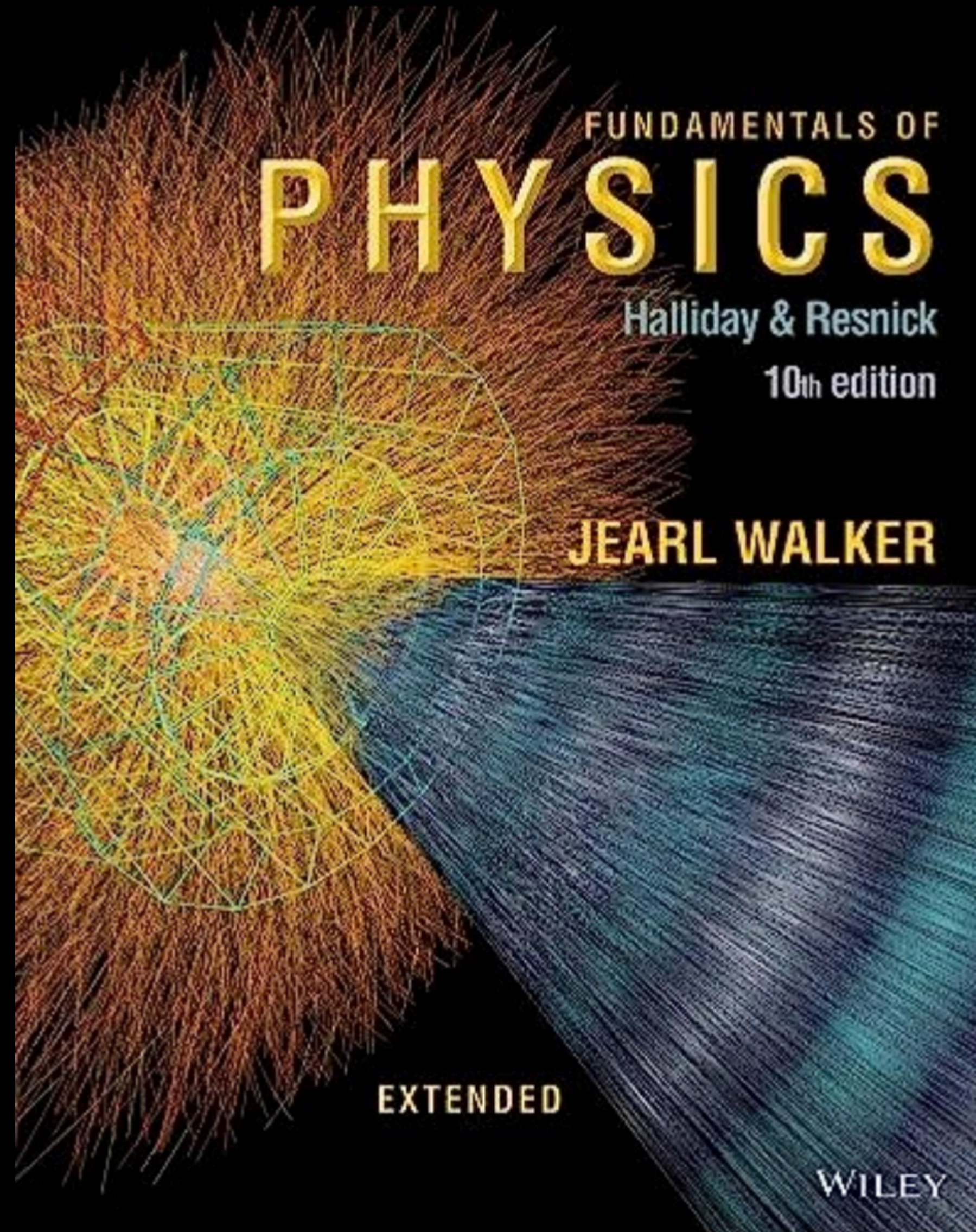
Month	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
April	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
May	27	28	29	30	1	2	3
	4	5	6	7	8	9	10

Office hours — poll

- I have created a poll here: <https://www.when2meet.com/?34577415-GEeXS>
- I have indicated my availability



Textbook



Hegi Center event

- What would you like the talk to be on:
 - Resume & Cover Letters
 - Interviewing Tips & Strategies
 - Job & Internship Search
 - Networking Tips, Platforms, & Strategies
 - Professional Communication and Skills for Career Success

Topics Covered

- Broadly:
 - Equilibrium and Elasticity
 - Thermodynamics
 - Fluid mechanics
 - Mechanical waves
 - Optics
 - Radioactivity
 - Electromagnetic phenomena

← We will start here! Chapter 12 of Halliday and Resnick

Course objectives

- Course objectives:
 - At the end of the course, the student will be able to:
 - Apply Archimedes Principle and Bernoulli's Equation to solve problems in fluid mechanics
 - Describe the properties of transverse and longitudinal mechanical waves and apply wave concepts to natural phenomena
 - Apply the three laws of thermodynamics and concepts of kinetic theory to solve problems in thermodynamics
 - Demonstrate basic skills in the use of oscilloscopes, function generators, RCL circuits
 - Summarize the properties of electromagnetic fields
 - Apply concepts of electromagnetic waves to basic optics and radiation
 - Perform and analyze the results from experiments pertaining to the above objectives

Course objectives

- Let's look at simple syllabus!

Structure of a warm up exercise

3306 physics lectures, Spring 2026

Prof. Saptarna Bhattacharya

https://www.physics.smu.edu/saptarnab/PH3306_Spring_2026/

Based on Simon Dalley's lectures delivered in spring 2025



WARM UP 0: Equilibrium & Elasticity

Write your answers in the space following the warm-up question if you can. Write as if you are explaining to a fellow student. If you need more space, you are probably over-thinking things.

Is it possible for a rigid body to be moving and yet in equilibrium? Explain.

Is the center of gravity of the Earth at its center of mass? Explain.

Structure of the homework exercise

PHYS 3306 Intermediate Physics

Homework A

Include all working in your answer. Be as detailed as possible so the reader (ex. another student) can understand what your reasoning was. It's best to write homework answers on more pages to give more space and clarity to your working.

1. What things are definitely wrong with the following final dimensionful answers:

(a) 27.35×10^2 , where the data used to calculate are 347 m and 25 s

(b) $a \exp(ax)$, where x and a are distances that already contain valid units

Dimensional Analysis Exercise

- What is the time period of a simple pendulum?
 - for small angles?

Equilibrium



Conditions for equilibrium

- The translational motion of a body governed by Newton's law is:

- $\vec{F}_{net} = \frac{d\vec{P}}{dt}$

- A body is in translational equilibrium if:

- $\vec{F}_{net} = 0$

Conditions for equilibrium

- The rotational motion of a body governed by Newton's law is:

- $\vec{\tau}_{net} = \frac{d\vec{L}}{dt}$

- A body is in rotational equilibrium if:

- $\vec{\tau}_{net} = 0$