

Physics 105  
Analytic Mechanics  
University of California, Berkeley, Spring 2021

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Lecture and Discussion Sections  
(We start 10 minutes after the hour or half hour)

## Analytic Mechanics

👤 Matthias W Reinsch

📅 TU, TH

🕒 12:30 pm - 1:59 pm

📍 Internet/Online

Class #: 23656

Units: 4

**Instruction Mode:** Remote Instruction

Offered through [Physics](#)

## Associated Sections

### PHYSICS 105 101

101 DIS

Class #: 23657

**Days:** Tu

**Time:** 5:00 pm - 5:59 pm

**Place:** Internet/Online

### PHYSICS 105 104

104 DIS

Class #: 26036

**Days:** W

**Time:** 4:00 pm - 4:59 pm

**Place:** Internet/Online

## Course Catalog Description

Newtonian mechanics, motion of a particle in one, two, and three dimensions, Lagrange's equations, Hamilton's equations, central force motion, moving coordinate systems, mechanics of continuous media, oscillations, normal modes, rigid body dynamics, tensor analysis techniques. Some knowledge of Python required for homework assignments. Students who have not taken Physics 77 or Data Science 8 are encouraged to complete the Python tutorials provided by the Physics Department.

Text: J. R. Taylor, *Classical Mechanics*, University Science Books.  
Depending on which printing of the book you have, you can find a list of errata at this [link](#) from University Science Books.

Further reading: D. Kleppner and R. Kolenkow, *An Introduction to Mechanics*, Cambridge University Press.

## Organization and Logistics

### Homework:

- (1) Try to solve problems by yourself first.
- (2) If you are unsure how to start a problem, review the Reading Assignment for the past week. Review each topic and ask yourself how it might apply to the problem at hand.
- (3) If you are still not sure how to solve a problem, you are encouraged to discuss the problem with others in the course.

You must write up your solutions based on your own understanding (no direct copying of others' work). A quote from Prof. Richard A. Muller, "Working together but not copying. How can you do this? I'll illustrate the answer with an example. You are totally confused on a homework problem. You get together with a classmate, who shows you his or her solution. 'Ah ha!' you say. Have you copied? No -- not yet. The trick now is to go away and now work out the solution yourself, without further looking at the friend's solution. The 'Ah ha' should have been sufficient."

- Please upload your work as a pdf file to bCourses.
- Late homeworks will usually not be accepted; just turn in whatever you have completed by the scheduled due date/time. Exceptions can be made for medical reasons, if you were psychologically affected by the coronavirus pandemic, or if you had Internet problems. Exceptions are not made in cases where you had an exam in another class or were busy with other things.
- Your lowest homework score is dropped and not included in your course grade.
- We request that solutions be hand-written. There are typically a few students who would prefer to typeset their solutions in LaTeX, and we can allow a small number of students to do this. Typically their work is very unique and easy to distinguish from other students' work. If too many students hand in LaTeX solutions, we will issue a statement for the next homework cycle that all homework must be hand-written.

### Prerequisites:

The prerequisites for this course are Physics 7ABC, Math 53 and Math 54 (Physics 89).

### Exam Information:

- Midterm Exam 1: March 2, during regularly scheduled lecture time.
- Midterm Exam 2: April 6, during regularly scheduled lecture time.
- Final Exam: More information will be posted soon.

**Course Grade:**

Historically, this course has been graded on a curve (top 35% of students get an A, next 40% get a B, then C's. Not required to give D's and F's). Because of the pandemic, the grading philosophy is different now. The course is not being graded on a curve. The performance of one student will not affect the grade of another. We will use numerical ranges of absolute scores to determine grades, based on comparisons with problems assigned in years past. The key concepts are Understanding and Ability to Apply the material.

A-range: 70-100

B-range: 50-69

C-range: 30-49

D/F: 0-29

Your numerical grade for this course is based on your homework, midterm and final exams. The break down is,

- Homework 20% (Your lowest homework score is dropped and not included in this average)
- First Midterm Exam 20%
- Second Midterm Exam 20%
- Final Exam 40%

## **Chapters in Taylor**

[Chapter 13 will be covered before Chapter 12.  
Chapter 12 will not be on the Final Exam.]

- 5. Oscillations
- 6. Calculus of Variations
- 7. Lagrange's Equations
- 8. Two-Body Central Force Problems
- 9. Mechanics in Noninertial Frames
- 10. Rotational Motion of Rigid Bodies
- 11. Coupled Oscillators and Normal Modes
- 12. Nonlinear Mechanics and Chaos
- 13. Hamiltonian Mechanics

## **Tutoring and other resources**

Physics 105 Group Tutor: Digvijay Roy Varier

<https://physics.berkeley.edu/academics/tutoring>

Python Tutor: Nachiket Girish

<https://physics.berkeley.edu/academics/tutoring>

### **Society of Physics Students (SPS):**

We have several resources available for your students to succeed in Physics 105, and wanted to make sure everyone knows about them.

The Society of Physics Students (SPS) is the official undergraduate voice of the Physics Department. Even though we're virtual again, SPS has many events planned for you this semester that you can make the most of, which you can find at [sps.berkeley.edu](https://sps.berkeley.edu) . We hope to see you there!

Here are some resources that we found helpful for your success this spring:

- **Gather**[Links to an external site.](#): A great location for you and your friends to work on homework or have COVID-safe fun group activities! Similar to an academic Pokemon, Gather's ability to foster organic conversations will give you the feelings of home we all miss :'). *The Reading Room, SPS Room, 375, and libraries are open.*
- **Physics Wiki**[Links to an external site.](#): We've put info [here](#) [Links to an external site.](#) on the in & outs of the department that's definitely more accurate than wikipedia. Questions? Read students' answers and contribute your own.