

**PHYS 1P21/91**[Video link](#)[Introduction](#)[Kinematics](#)[Dynamics](#)[Work+Energy](#)[Rotational Motion](#)[Momentum](#)[Oscillations+Waves](#)[Homework](#)[Lecture notes](#)[WeBWork](#)[Textbook](#)[PPLATO](#)[iOLab online](#)[Formula Sheet](#)[Outline](#)[Calendar entry](#)[Help](#)**PHYS 1P21/91 course outline**Instructor: [E. Sternin](#)**— What is this course all about?****What [Brock calendar entry](#) says:**

Kinematics, Newton's laws and their applications to equilibrium and dynamics; special relativity.

Mechanics is about motion, which is fundamental in physics, and this course provides an introduction to understanding motion. Mechanics can be separated into two aspects, kinematics (the mathematical description of motion) and dynamics (which explains the detailed causes of motion, and quantifies their effects). Newtonian mechanics is an extremely successful theory for describing and explaining many phenomena in our every-day experience. Using Newtonian mechanics, we have been able to construct bridges, towers, homes, tall buildings, machines, and so on, and they work beautifully as expected. Airplanes, trains, cars, and even spacecraft all work well, and arrive at planned destinations, in accord with Newtonian mechanics.

Understanding the inner workings of electronic devices (such as computers, smart phones, etc.), lasers, solar cells, the interiors of molecules, atoms, and atomic nuclei, energy production in the sun and stars, and all manner of other exotic phenomena, requires more: electromagnetic theory, thermodynamics, and the kind of deeper understanding of mechanics that only became known in the 20th century: quantum mechanics. These topics are covered in other Physics courses, but the skillset developed in this Introductory Mechanics course will be directly transferable. Not only the Newtonian mechanics is an excellent theory for the macroscopic world, it forms the foundation of all other topics in Physics.

**What do I need to bring into the course?**

This course is suitable for students with a high school science background. High school calculus or Physics are *not* required, but strong skills in elementary algebra, geometry, and trigonometry are necessary: the course is *quantitative* in nature. A good scientific calculator is required.

**— Textbook and other resources****Textbook**

Our textbook is *College Physics*, second edition, by Urone, Hinrichs, Dirks, and Sharma, published by OpenStax (Rice University). The book, a solution manual, and other student resources are available at <https://openstax.org/details/college-physics>.

**PPLATO**

[PPLATO](#) a set of online resources organized as a full-scale Physics and Mathematics textbook. There are two types of resources: in the left column there are FLAP (Flexible Learning Approach to Physics), while on the right are supplementary self-assessment modules. Think of the left-hand column as of the chapters of a complete textbook, and of the right-hand column as of tutorials on a selection of topics.

**Supplementary (paper) texts**

Some people like to have secondary sources to read in case they have difficulty understanding the primary textbook in some places. This is *not* required, but if you would like a secondary source, borrow one from a library, or buy an inexpensive used algebra-based textbook from your favourite used bookstore or internet source. Look for titles such as *Physics* or *College Physics*. If your major subject is Physics or a related field, and you would like a more advanced (say, calculus-based) textbook for reference, look for titles that include "for Scientists and

Engineers."

**– Topics to be covered**

As time permits, some topics not listed below may be added, while some other topics may not be covered during lectures and tutorial sessions. The outline below is only an approximation.

- » Nature of physical laws
  - » Scientific notation
  - » Errors, precision, and significant figures
  - » Physical units and dimensional analysis
- » Kinematics: motion in one and two dimensions
  - » Displacement vectors
  - » Algebra of vectors
  - » Mathematical tools
  - » Speed, velocity, and acceleration
  - » Kinematics in 2D
- » Dynamics
  - » Newton's Laws
  - » Gravity
  - » Contact forces
  - » Applications of statics
- » Rotational motion
  - » Kinematics of rotational motion
  - » Dynamics of uniform rotation
  - » Torque and moment of inertia
  - » Simple machines
- » Work, energy, momentum
  - » Work and energy
  - » Linear momentum
  - » Collisions in 2D
  - » Rotational
  - » Conservation of angular momentum, gyroscopic effects
- » Oscillations and waves
  - » Simple harmonic oscillator
  - » Sound waves

**– Tests and the grading scheme**

Component	PHYS 1P21	PHYS 1P91	Comments
homework	15%	15%	Weekly homework is assigned and graded through WeBWork online testing system. Repeated attempts are possible, as the problems are randomly selected and modified. A mixture of qualitative and numerical problems.
weekly tests	50%	35%	11-12 tests, conducted during the Thursday time slot. The problems are similar to those practiced in WeBWork, solved by hand on paper. Two lowest test grades (but not zeros for tests missed without a medical/compassionate excuse) are dropped from the average.
final exam	35%	30%	A limited-time, limited-attempt WeBWork exam is being planned for December, IT support permitting. You must pass the final exam (50% or more) in order to pass the course.
laboratories	-	20%	Completing all labs, and submitting all written lab reports are required to complete the lab component of the course. Students receiving the lab grade that is lower than 60% will be required to withdraw from PHYS 1P91, and will only be able to receive a grade in PHYS 1P21.

## – Expectations and responsibilities

Here is a summary of our expectations of you, which are your responsibilities. You are expected to:

- » [attend each scheduled lecture and laboratory session](#);
- » do your work honestly and maintain – **academic integrity**;  
Academic misconduct is a serious offence. The principle of academic integrity, particularly of doing one's own work, documenting properly (including use of quotation marks, appropriate paraphrasing and referencing/citation), collaborating appropriately, and avoiding misrepresentation, is a core principle in university study. Students should consult "[Academic Misconduct](#)" section in the Undergraduate Calendar to view a fuller description of prohibited actions, and the procedures and penalties. The University takes academic misconduct extremely seriously and will follow its strict procedures to the letter in all cases.

A helpful website explains Brock's [Academic Integrity Policy](#). Please consult it, as all students are expected to know and abide by its provisions.

- » complete each test, using only the materials that have been authorized for use, such as a non-graphics calculator and writing instruments;
- » attend labs (PHYS 1P91) having **prepared in advance** by reading relevant parts of the lab manual, and having completed the prelab problems.

And most important of all, you must take responsibility for your own learning. The lectures are there to guide you and assist you, but only you can actually do the hard work of learning the course material. To get the most out of the course, work on it a little bit every day. Daily work is key for placing your learning in long-term memory, where it will be readily available to help you to advance your knowledge in second year and beyond - and acing the final exam, of course. Cramming on the night before may place the material in your short-term memory and you might even do fine on a weekly test, where the amount of new material is relatively small, but this approach will fail miserably on the final exam.

Your instructor will provide weekly textbook chapter references; read through those section. The best way is to read them twice: once before the lectures, just to orient yourself in the material, to identify those parts that seem like they might need extra time and attention. Make a note of the questions that arise in your mind. The lecture should answer some of them, and if it does not, raise your hand and ask! It is likely that many others have the same question. After the lecture, read the textbook again, with a pen and paper in hand, repeating all derivations on your own, trying every solved example before looking at the solution, then solving every follow-up questions at the end of the section. Only one half of them have answers; you must learn to have enough confidence in your skills to solve even those problems where the answer is not known in advance. The odd-numbered problems will allow your to make sure, and the even-numbered ones will allow you to test yourself. Both are integral to the learning process.

Use your time effectively. Study smart, instead of hard. Ask questions in class. Your instructor has an open-door policy, so outside of a few restricted hours, you are always welcome to come and ask a question one-on-one. Do not wait until you have a "worthy" pageful of questions - that's too long to let them fester unanswered. There is also a Physics Help Desk, with TAs available to help out. Find out where and when it is held, and come often. It is better to come three times with one or two questions than once with a list accumulated over the past several weeks, when things get too desperate. Asking questions is a sign of active learning, not a sign of weakness.