

# Physics 151: General Physics 1

Fall 2022

## Instructor

David Hamilton

## Email

drhamilton@umass.edu

## Office Location & Hours

Hasbrouck 123 | Monday 2-3PM  
(or by appointment)

## Lecture Meeting Times:

SEC01: MWF 11:15AM 12:05PM	SEC02: MWF 12:20PM - 1:10PM
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Course Website (Moodle): <https://umass.moonami.com/course/view.php?id=32748>

Graduate TA: Joanna Wuko ([jwuko@physics.umass.edu](mailto:jwuko@physics.umass.edu))

Supplemental Instructors: Aditya Singh ([asingh0@umass.edu](mailto:asingh0@umass.edu)) and Sam Leonard ([sleonard@umass.edu](mailto:sleonard@umass.edu))

## Description and Course Goals

Mechanics is the study of motion. This course is about the classical theory of motion governed by Newton's laws, with material divided into three broad subjects:

- First, we cover basic kinematics (the description of how things move) with an overview of motion concepts and simple examples: motion with constant velocity and motion with constant acceleration such as projectile motion and circular motion.
- We continue with the study of dynamics (adding the description of reasons why things move) and exploration of several common forces: gravity, string tension, friction, drag, and (following Newton's third law) thrust.
- Finally, we consider conservation laws with emphasis on momentum, energy and mechanical work, and how they help the study of motion.

Instruction concentrates on basic principles of physics and general problem-solving techniques, both in class and in web-based homework assignments.

Throughout this course, students can expect to sharpen their analytical and quantitative problem-solving skills and expand their understanding of fundamental properties of the universe. Physics 151 satisfies the Physical Science (PS) general education requirement, as it breaks down many of the core principles which govern how macroscopic objects move in nature. Additionally, through the lab component, students have the opportunity do experiments, make observations, record facts, and evaluate and interpret data.

## Course Grading:

- 20% Laboratory Component: 15% Lab, 5% Discussion Sections.
- 30% Homework: 12 equally weighted assignments + 1 extra credit assignment (HW00).
- 50% Exams: Two Midterms and a Final.
  - Your highest two exams are worth 20% each. Your lowest exam is worth 10%.
- Grades will be assigned according to the standard UMass rubric, rounded to the nearest integer. The instructor reserves the right to alter the rubric if circumstances require.

A	A-	B+	B	B-	C+	C	C-	D+	D	F
≥ 93	< 93 and ≥ 90	< 90 and ≥ 87	< 87 and ≥ 83	< 83 and ≥ 80	< 80 and ≥ 77	< 77 and ≥ 73	< 73 and ≥ 70	< 70 and ≥ 67	< 67 and ≥ 60	< 60

## Essential Course Information

- **Lectures:** Lectures are given in Hasbrouck 20. Lectures will be recorded, and lecture slides and recordings will be posted on Moodle. Attendance at lectures is strongly recommended.
- **Homework:**
  - Homework is assigned weekly. The first one is due on September 13 at 11:59 pm Eastern. There are 12 homeworks and one extra credit assignment.
  - We use the Mastering Physics online homework system. Instructions for purchasing this required system are given on the last page. **Please do this as soon as possible.**
  - For *all* technical issues with the homework system, contact Pearson support: <https://support.pearson.com/getsupport/s/contactsupport>
- **Laboratory Component:** The laboratory component is required. *All questions about the lab should be directed towards your lab TA or Prof. P. Bourgeois.*
- **Discussion Sections:** Discussions are for working on problem solving skills associated with topics discussed in lecture. They are held in the lab room on weeks where labs are not held.
- **Midterms and Final:** There are 2 midterms and a final. The tests are not cumulative, and each covers roughly 3 to 5 weeks of course material. The midterms are on October 20 and November 15. The final date is TBA, and it will not be cumulative. Exams are scheduled to be given in-person on campus, rooms TBA. Exam review questions will be made available online prior to each test.

## Textbooks

- “Physics for Scientists and Engineers” by Randall Knight, 5<sup>th</sup> Edition
- The Mastering Physics homework system gives you free access to this textbook online.
- (Optional) OpenStax: University Physics Volume 1
- Freely available at <https://openstax.org/details/books/university-physics-volume-1>
- (Optional) The Portable TA by Andrew Elby
- A book full of relevant practice problems, their solutions, and problem-solving strategies.

## Prerequisites

- No prior knowledge of physics is assumed in this course.
- A solid working knowledge of algebraic manipulation, geometry, and trigonometry is critical. Some math review homework questions are included to introduce the mathematical methods used in the course, and to help you identify your areas of strength and weakness.
- Prior knowledge of calculus is helpful, but not necessary. Math 131 (Calculus I) is a co-requisite; you should take it concurrently with Physics 151, if not before.
- Co-enrollment in an associated laboratory section is required. The lab contributes 20% of the overall course grade.

## Course Policies

### Primary Student Responsibilities

As a student, it is your responsibility to take each exam, attend your classes and labs, and complete all the assignments when they are due. If you are having difficulty carrying out these responsibilities, you must communicate to me about this in a timely manner, so that I can provide reasonable accommodations. Additionally, if you are unable to solve the homework on your own, please take advantage of the help resources on the following page.

### Accommodation Statement

University of Massachusetts Amherst is committed to making reasonable, effective, and appropriate accommodations to meet the needs of students with disabilities and help create a barrier-free campus. If you have a disability and require accommodations, please register with Disability Services to have an accommodation letter sent to your instructor. Information on services and materials for registering are also available on their website [www.umass.edu/disability](http://www.umass.edu/disability)

### Makeup Exams

If you have a conflict or are registered with Disability Services, please contact the TA at least a week before each midterm and the final so that your needs can be addressed. Other circumstances will be considered individually with appropriate documentation. Typically, a flexible window will be offered in which to take midterms to accommodate conflicts, work schedules, etc. **Generally, makeup exams will not be offered after the date of the scheduled exam.**

### Late Homework Policy

- Homework assignments are usually due Tuesday 11:59 pm of each week. Late homework is accepted, but only awarded partial credit. After a 72-hour grace period\*, the maximum credit possible for incomplete problems decreases by 10% per day after the deadline until it reaches 60%, then it stays at 60% until the last day of classes. Questions completed before the due date receive full credit; only questions not completed by the due date are subject to a late penalty.
  - *\*Note: Grace periods are applied some time after the due date. A late penalty will temporarily appear if your assignment was turned in late, but during the grace period.*
- Further extensions on assignments due to extenuating circumstances will be considered individually with documentation from the Dean of Students, University Health Services etc.

### Academic Honesty

- You are actively encouraged to work on homework together, but midterms and final exam must be done completely independently. *Cheating* on the homework is strongly discouraged, and it may leave you totally unprepared for the exams.
- Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty.

### COVID-19

- Masking and/or distancing is strongly recommended. Eating and drinking is not permitted in class.
- If you are not feeling well, do not come to lecture. Lecture recordings are posted on Moodle; you may review them at home.
- I understand that the pandemic has caused difficulties for everybody, and I am willing to make reasonable accommodations as needed. Please speak with me or the Dean of Students office if you are having personal or academic challenges and need support.

## Help Resources

Physics 151 can be a challenging class for many students. Because of the large enrollment of this class, opportunities for 1 on 1 instruction can be limited, unless you take the initiative to seek them out. Fortunately, there are several different resources for tutoring and supplemental instruction available. Some of these may be a better fit for your learning style than others, so don't hesitate to try a different resource—or a different tutor—if you're not getting what you need.

### Supplementary Instructors and Worksheet Moodle Pages:

Supplemental Instruction (SI) sessions are informal, peer-facilitated group learning seminars. SI sessions meet twice per week, time to be determined after the 1<sup>st</sup> week of classes. Participation in the SI program is completely voluntary and open to all students enrolled in the course. SI leaders will post their worksheets and other materials on the following Moodle link:

<https://umass.moonami.com/course/view.php?id=32163>

### Learning Resource Center:

The LRC offers drop-in tutoring sessions for several hours each week, in addition to tutoring by appointment. Dedicated drop-in times will be shown on the course Moodle.

### Office Hours:

The Professor and TA provide office hours each week for one-on-one help and assistance. Times/locations will be posted on Moodle. Additional times are available via appointment.

### Physics Help Room:

The Physics department holds help sessions in HAS 115 most of the day, every day. You can see the schedule on the course Moodle. The help sessions are held by TA's in introductory Physics courses such as this one, who should be well equipped to answer your questions.

### Ad Hoc Study Groups:

You may find it helpful to organize with your fellow Physics 151 students to form study groups. This can be a great way to work through challenging parts of the course, and also to make friends.

### The Portable TA:

This optional text contains several practice Physics problems, in-depth solutions to these problems, and problem-solving strategies relevant to this course. You may find it valuable to work through these problems in parallel with the relevant homeworks.

## General Tips For Success

- Try to start the homework a few days before the deadline. If there are problems you are stuck on, try consulting the above help resources, or the relevant section in the book.
- Most problems should be worked out on a piece of paper before you start inputting numbers into your calculator. It is advised to keep algebra in terms of symbols and plug numerical values in at the end; otherwise, it can be hard to identify your mistakes.
- You will be penalized slightly for each wrong answer you submit to Mastering Physics. To maximize credit, avoid submitting answers unless you believe them to be correct.
- Exam review problems are posted before each exam. Working through these can be a great way to prepare for the exam, and to identify areas where you can improve.

## Course Schedule

Week	Topics	Assignments / Key Dates
<b>Week 1</b> 9/7-9/9	Course Introduction Fundamental Units	HW00 - due 9/13 [Extra Credit]
<b>Week 2</b> 9/12 -9/16	Representing Motion Position and Velocity	HW01 - due 9/20 9/12 - Drop Deadline
<b>Week 3</b> 9/19 -9/23	Motion in 1D Acceleration	HW02- due 9/27
<b>Week 4</b> 9/26 - 9/30	Vectors Free Fall	HW03 - due 10/04
<b>Week 5</b> 10/3 - 10/7	Motion in 2D Projectile Motion	HW04 - due 10/11
<b>Week 6</b> 10/12 - 10/14	Motion in 2D Circular Motion	HW05 - due 10/18 10/10 - No Class (Indigenous Peoples' Day)
<b>Week 7</b> 10/17 - 10/21	Force Newton's Laws	<b>MIDTERM 1 - 10/20</b> HW06 - due 10/25
<b>Week 8</b> 10/24 - 10/28	Friction Newton's 3 <sup>rd</sup> Law	HW07 - due 11/1
<b>Week 9</b> 10/31 - 11/4	Motion in a Plane Forces in Circular Motion	HW08 - due 11/8 11/1 - Last day to Drop with 'W' and select 'P/F'
<b>Week 10</b> 11/7 - 11/09	Work Power	HW09 - due 11/17 11/11 - No Class (Veterans' Day)
<b>Week 11</b> 11/14 - 11/18	Energy Conservation of Energy	<b>MIDTERM 2 - 11/15</b> HW10 - due 11/22
<b>Week 12</b> 11/21 - 11/22	Catch-Up Week	<b>No Homework</b> 11/23-27 - No Class (Thanksgiving)
<b>Week 13</b> 11/28 - 12/2	Impulse and Momentum Momentum Conservation	HW11 - due 12/6
<b>Week 14</b> 12/5 - 12/9	Torque Angular Momentum Rotational Dynamics	HW12 - due 12/12
<b>Week 15</b> 12/12	Final Review	<b>No Homework</b>
<b>Finals Week</b>		<b>FINAL EXAM - TBA</b>

## Online Homework System: Mastering Physics

We require the online homework system called Mastering Physics. The Mastering Physics online homework system also offers access to the course textbook, *Physics for Scientists and Engineers* by Randall Knight, for free. It is not required to purchase the loose-leaf book.

To register for the Physics 151 homework system:

1. Go to <https://mlm.pearson.com/enrollment/hamilton05663>
  2. Sign in with your Pearson student account or create your account
  3. Select the option to buy access using a credit card or PayPal.
    - o If you are waiting on financial aid, select “Get temporary access without payment for 14 days.” You will be required to purchase access after the free period ends.
  4. Select Go to my course.
  5. Select Physics 151 from My Courses.
- For technical issues with the homework system, contact Pearson support: <https://support.pearson.com/getsupport/s/contactsupport>.
  - If you contact Pearson Support, give them the course ID: hamilton05663

To sign in later:

1. Go to <https://mlm.pearson.com>.
2. Sign in with the same Pearson account you used before.
3. Select Physics 151 from My Courses.

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*In previous semesters, the University offered an “Inclusive Access” program where the cost of Mastering Physics was added directly to students’ tuition, and in exchange they were given an “access code” to activate it. This program was discontinued. In response to this somewhat annoying turn of events, I negotiated a lower rate with Pearson for 151 students: \$50 for 18 weeks of access (normally \$70).*