



Boston University
PY105 Summer I 2022
Physics I

Instructor: Paul Trunfio

Office: SCI 205

Email: trunfio@bu.edu – put **PY105** in the subject heading; but a private message on Piazza is preferable, see p. 3.

Phone: 617-353-3782

Teaching Fellows: Jon Barlow, Meadow Bradsby, Nathan Rose, Declan Smith, Umut Eren Usturali, Emilee Wurtz;

Learning Assistants: Quinn La Fond, Mable Lin, Sumner Warden. *Note you can contact any TF or LA or all instructors privately through Piazza (see below)*

A1 Studio Session – M/T/W/R 10:30 am – 12:20 pm – SCI B23 ** See notes below

A3 Lecture & Demonstrations – M/W/R 9:10 am – 10:20 am – SCI 109 ** See notes below

A6 (Lab) – W 12:30 pm – 2:20 pm – SCI 134 ^^ See schedule below (meets M on Week 6)

A7 (Lab) – R 12:30 pm – 2:20 pm – SCI 134 ^^ See schedule below (meets T on Week 6)

A8 (Lab) – R 2:30 pm – 4:20 pm – SCI 134 ^^ See schedule below (meets T on Week 6)

** On the course schedule, the BU Registrar does not have a label for “studio” format classes, hence A1 is labeled “lecture” instead. Because of this, the A3 lecture is labeled as a “discussion.” This syllabus goes into more detail about the flow and structure of the course. Also note that our actual meeting times are slightly shorter than what is listed on the BU course listing. Note also that the A2 section is closed (as enrollments are such that we do not need to add another section), and also A4 and A5 lab sections are closed for the same reason.

Office Hours: Office hours will be posted to Piazza and our online course calendar during the first week of the course.

Course Description: The CAS PY 105/106 sequence satisfies premedical requirements. PY105 covers some of the basic principles underlying the physics of everyday life, including forces and motion, momentum and energy, harmonic motion, rotation, and heat and thermodynamics. Carries natural science divisional credit (with laboratory) in the College of Arts and Sciences. This course fulfills a single unit in each of the following BU Hub areas: Scientific Inquiry I, Quantitative Reasoning I, Critical Thinking.

Course Structure Overview: We invite you to join us in actively creating and contributing to a positive, productive, and respectful classroom culture. We have planned a course that has different teaching and learning modes designed to foster a rich and engaging experience. Everyone contributes to an environment that shapes the learning process. To this end, it is expected that all students attend classes (lecture, studio and lab) when they are scheduled; see schedule and further descriptions on page 2 onward. It is to your advantage to participate during lecture, because your active participation will help you grasp concepts plus count toward your participation grade.

Student Expectations: While it is important to work collaboratively with other students in the course, you also have to make sure that you can answer questions and solve problems on your own. We expect you to learn the material yourself - that takes time and effort - and we expect all your submitted work to be done by you. Just like you can't become a good soccer player just by watching videos of Lionel Messi or Ashley Morgan (instead, you have to practice yourself), you can't get good at solving physics problems by trying to Google the answers. We expect you to actually do the hard work yourself to figure out how to solve problems. We are also happy to help by answering questions on Piazza and in office hours, but, continuing the soccer analogy, think of us as coaches. We are not there to do the work for you, but to help you reach your potential. You may not always get the correct answer, and that is OK. The process of self-reflection and correction when you make mistakes is more important than always getting the right answer.

Proprietary material: Almost all the material in the course is created by us and is copyrighted. You are not allowed to post any course material anywhere outside of our course websites. Using sites like chegg.com is strictly not allowed.

BU PY105 – Physics I – Summer 2022 Schedule

Week	Date	Lecture & Demos (SCI 109) M/W/R 9:10-10:20 (A3)	Homework	Studio (SCI B-23) M/T/W/R 10:30-12:20 (A1)	Labs (SCI 134) W 12:30-2:20 (A6), R 12:30-2:20 (A7), or R 2:30-4:20 (A8)
1	5/24 Tue			L-01 Vectors & WS-01	
	5/25 Wed	L-02 1D Kinematics & Constant Acceleration		WS-02 & WS-03	Lab #1 - Forces & Carts
	5/26 Thu	L-03 Newton's Laws & 1D Forces		WS-04 & WS-05	
2	5/30 Mon	No Class - Memorial Day	HW #1		
	5/31 Tue		e-Book #1	Quiz #1 (L-01 - L-03)	
	6/1 Wed	L-04 2D Kinematics & Projectile Motion		WS-06 & WS-07	Lab #2 - Constant Acceleration
	6/2 Thu	L-05 Friction		WS-08 & WS-09	
	6/3 Fri*	L-06 Applying Newton's Laws		WS-10 & Lab #3	
3	6/6 Mon	L-07 Circular Motion	HW #2	WS-11	
	6/7 Tue		e-Book #2	Quiz #2 (L-04 - L-06)	
	6/8 Wed	L-08 Impulse & Momentum		WS-12	Lab #4 - Momentum
	6/9 Thu	L-09 Center of Mass, Work and Collisions		WS-13	
4	6/13 Mon	L-10 Energy Conservation	HW #3	WS-14	
	6/14 Tue		e-Book #3	Quiz #3 (L-07 - L-09)	
	6/15 Wed	L-11 Energy Conservation & Collisions		WS-15	Lab #5 - Energy
	6/16 Thu	L-12 Torque & Equilibrium		WS-16	
5	6/20 Mon	L-13 Buoyancy	HW #4	WS-18	
	6/21 Tue		e-Book #4	Quiz #4 (L-10 - L-12)	
	6/22 Wed	L-14: Fluid Statics		WS-19	Lab #6 - Fluids
	6/23 Thu	L-15: Fluid Dynamics & Viscosity		WS-20 & WS-21	
6	6/27 Mon	L-16: Temperature, Heat & Ideal Gases	HW #5	WS-22 & WS-23	Lab #7 - Calorimetry†
	6/28 Tue			WS-24	
	6/29 Wed	L-17: Thermodynamics	HW #6	WS-25 & WS-26	
	6/30 Thu	Quiz #5 (L-13 - L-17)	e-Book #5	Wrap-Up	

* = Substitute Monday schedule

† = Mon (A6) and Tue (A7 or A8), Week 6 Lab

Course Components:

- Lecture and Demonstration - M/W/R 9:10-10:20 am (A3) in SCI 109:** Each lecture will be interactive with an explanation of physics concepts, simulations and physical demonstrations along with periodic participation-only questions that you can answer via the Top Hat learning platform in real time. These in-class questions count as your course participation grade.
- Studio Session - M/T/W/R 10:30 am-12:20 pm (A1) in SCI B-23:** Each studio session will follow from the lecture whereby you will collaborate with your fellow students on conceptual and problem-based worksheets, supported by teaching fellows and learning assistants. The studio classroom is a large flexible space that has round tables each seating up to nine students, whiteboards and smart boards all throughout and hands-on experiments to explore the concepts you are learning about. You can use this time to collaborate on worksheets, get help on homework problems, follow up on questions from the lecture, etc. This is your time to use to your best advantage. By active collaboration during these studio sessions, with peer and instructor support, you should be able to reduce the amount of time you will need to study on your own as well as gauge your progress. While none of the worksheets are graded, there will be a brief assessment of your effort on each worksheet on Top Hat graded partly on correctness and partly on participation. This graded element is not meant to be onerous, but rather to help you keep up with the pace of the course and earn credit for your

effort. Each Top Hat “assessment” is due at the end of the studio time (and full solutions for the worksheet will be posted shortly thereafter).

3. **Laboratory - W 12:30-2:20 pm (A6), R 12:30-2:20 pm (A7) or R 2:30-4:20 pm (A8) in SCI 134:** There are 7 labs for this course, two of which are entirely simulation based. With the exception of Lab 3, which will be mostly a take-home, they will take place during the studio time, permitting us to streamline the schedule such that we will have one dedicated lab period per week. The labs are designed to complement and reinforce the concepts you are learning by giving you a hands-on authentic experience.

Course Resources Overview:

- Course postings, worksheets, calendar, announcements and discussion board: piiazza.com
- Homework, lecture participation, worksheet assessments, labs, and e-Book: tophat.com
- Grades on Blackboard Learn: learn.bu.edu
- Scanned and graded quizzes with rubrics: gradescope.com
- Some office hours and virtual appointments: [bostonu.zoom.us/my/buphysics/](https://bostonu.zoom.us/j/9123456789)

Required Course Materials:

- **Scientific calculator** (NOT a mobile phone app) which has sine, cosine, exponential and their inverse functions. This will mainly be used for homework assignments, quizzes, labs, etc.
- **Top Hat** – tophat.com – See Getting Started on Top Hat (below). Registration for Top Hat is available for desktop/laptop or mobile device and is a paid subscription service. **You must register before the first day of lecture to receive credit for lecture participation as well as all assignments.** Follow the link in the email invitation you received or go to <https://app.tophat.com/register/student>.
- **Textbook:** *Essential Physics*, by A. Duffy, Volume I which is an interactive e-Book integrated with our Top Hat course. If you would like another option, we will post a free PDF version and if you prefer a hardcopy, you can buy one from Amazon.

Course Web Sites:

- **Piazza** – piiazza.com/bu/summer2022/py105 – Piazza is our course homepage and contains all course information (including this syllabus), various physics learning resources, lecture notes, worksheet postings, homework and worksheet solutions, etc.
 - Additionally, Piazza has a public Q&A forum for you to ask questions about any aspect of the course, including questions about homework problems or any other course work. You can also feel free to answer any questions posted by other students – but you should be careful to be helpful without simply giving away answers to homework questions. With all PY105 students, Teaching Fellows, Learning Assistants and Prof. Trunfio monitoring the Piazza site, this should be the best way to get questions answered quickly. We ask all students and instructors to be actively engaged on Piazza.
 - **Please do not post questions of a personal or sensitive nature on the public message board.** Piazza allows for direct private posts. Click **New Post**. **Post type: Question.** **Post to: Individual Students(s) / Instructors(s).** Type **Instructors** to include all instructors (including TF's and LA's) or type individual names.
 - If you have an issue that is of a more personal nature or otherwise sensitive, you can send a direct message to Prof. Trunfio only. Click **New Post**. **Post type: Question.** **Post to: Individual Students(s) / Instructors(s).** Type **Paul Trunfio** to reach Prof. Trunfio only. This is the preferred way to contact me directly (as opposed to email or office phone) as I have mobile notifications set up for Piazza.
- **Blackboard Learn** – learn.bu.edu – In your course list, click on the link for PY105. We use Blackboard for grades only, and nearly all grades can be found on Top Hat first before they get uploaded to Blackboard (except for quizzes which will be on Gradescope); and they all eventually get synced to Blackboard. Your login name is your regular BU login name and your password is your BU Kerberos password. It is your

responsibility to check that your grades have been recorded correctly. If any of your grades are missing or incorrect, contact a teaching fellow or Prof. Trunfio.

Course Grade: Your letter grade will be assigned on the basis of the total score you accumulate throughout the course. Your grade is based on these factors alone; there will be no extra credit. That said, by staying engaged, you can accumulate points for many of these factors. It is your responsibility to take all quizzes and do all homework and labs according to the course schedules; late work will not receive any grade. We will not drop the lowest score for any assignment, quiz, or lab. Note, that at any time you can calculate what your grade is in the course based on your scores to date using the weights below. Each factor will contribute as follows:

- Studio worksheets: 10%
- Lecture participation: 5%
- Homework Assignments: 12%
- e-Book Assignments: 5%
- Labs: 13%
- Quizzes: 55% - five quizzes equally weighted

Grading Scale: We will use an absolute grading scale, so you are not competing with your classmates. This is designed to encourage you to help each other learn. The scale is as follows:

90.00 – 100 = A- and A
75.00 – 89.99 = B-, B and B+
60.00 – 74.99 = C-, C and C+
50.00 – 59.99 = D
< 50.00 = F

Makeup Policy: It is your responsibility to do all assignments, quizzes, and labs according to the posted schedules. Many of the assignments will routinely appear in Top Hat during the course, while dates for quizzes and labs are shown in the course schedule. Due to the fast-paced nature of the course, there are no makeups. *In the rare event of illness, a religious holiday, or an extraordinary emergency, please contact Prof. Trunfio as soon as possible to coordinate alternatives.*

Important Registrar Dates:

- May 31, 2022: Last day to register/add the course
- May 31, 2022: Last day to drop without a “W” grade
- June 16, 2022: Last day to drop with a “W” grade

Ethics Policy: As a student at Boston University, you are expected to be familiar with and adhere to the College of Arts and Sciences Academic Conduct Code. In particular, cheating on exams and quizzes or unauthorized collaboration on lab work will not be tolerated. Evidence of cheating will be reported immediately to your Academic Conduct Committee. Students found guilty of cheating on exams may be penalized by suspension or even expulsion. Link to the code: www.bu.edu/academics/policies/academic-conduct-code/

Course Elements & Dates - *The course elements are described above in the course schedule on page 2 and course components on pages 2 and 3 and course grade on page 4. Here we provide more detail so you can gain a more complete picture of what the course entails.*

Quizzes: There will be five quizzes, spaced at the end of each unit of instruction (all during studio time on Tuesdays, so you can prepare the preceding weekend, except the last quiz which is on the last day of the course). The content covered in each quiz is indicated in the class schedule above. Dates are: **May 31, June 7, June 14, June 21, June 30**. Each quiz will have an announcement and details posted to Piazza the week prior, along with an equation sheet. Each quiz will have practice problems for you, handed out in the studio session meeting immediately before the quiz day. All quizzes are paper-based and will be scanned and graded on Gradescope using a consistent rubric.

Homework: Homework consists of (1) weekly problem sets on Top Hat and (2) electronic book (e-Book) problems, both of which are aimed at helping you build problem solving skills.

(1) Homework Problems: Each assignment will include relevant simulations and problems on Top Hat. Solutions will be posted immediately after the due date, to help you prepare for each quiz (which is usually the following day). **There will be no extensions granted**, so plan early and use studio time and office hours wisely (as well as posting to Piazza for tips from fellow students). Each assignment is **due at 9 am according to this schedule**:

Assignment 1: Assigned Tuesday, May 24; Due Monday, May 30

Assignment 2: Assigned Thursday, May 26; Due Monday, June 6

Assignment 3: Assigned Thursday, June 2; Due Monday, June 13

Assignment 4: Assigned Thursday, June 9; Due Monday, June 20

Assignment 5: Assigned Thursday, June 16; Due Monday, June 27

Assignment 6: Assigned Thursday, June 23; Due Wednesday, June 29

(2) E-book Assignments: The e-book on Top Hat is graded out of 50% of the possible total points (i.e., 50% points earns you 100% points). Further, all questions are graded half on correctness and half on participation, so even if you are incorrect in an answer, you will earn half points. All this means is that you should not stress about getting every answer correct or even answering every question/problem, though the more you work on, the more confidence you will likely gain. After two incorrect answers for main questions and five incorrect answers for module self-assessments, Top Hat will show you the correct answer as well as an explanation. The goal of the Top Hat e-book assignments is to give you some incentive to read and practice outside of class. Your goal should be simply to do as many questions you assess are required to grasp the concepts. The Top Hat e-book modules are split into parts that match the topics and align with the dates of each quiz. For example, the first section of e-book modules is **due at the start of Quiz 1, and that pattern continues** for all the other e-book sections. **The ideal way to use the e-book is to keep up with the class material, rather than waiting until just before the due date to do it.**

Laboratory: All labs are assigned on Top Hat, each has a pre-lab that we suggest you complete before the lab, however both the pre-lab and lab will be due on Top Hat approximately 36 hours after the last lab session (**e.g., a lab held on Wed/Thu, the usual case, will be due Saturday morning by 9 am**). Lab schedule is as follows:

Lab 1: Wednesday, May 25 or Thursday, May 26: Forces Between Carts

Lab 2: Wednesday, June 1 or Thursday, June 2: Constant Acceleration

Lab 3: Friday, June 3 (during studio): Projectile Motion Simulation* Note: substitute Monday schedule

Lab 4: Wednesday, June 8 or Thursday, June 9: Momentum

Lab 5: Wednesday, June 15 (during studio): Energy Simulation

Lab 6: Wednesday, June 22 or Thursday, June 23: Fluids

Lab 7: Monday, June 27 or Tuesday, June 28: Calorimetry

Worksheet Assessments: As discussed above, each worksheet during the studio sessions has a brief assessment associated with it. Each is due by the end of the studio session.

Getting Started with Top Hat

We will use Top Hat for five different aspects of our course this semester, all of which count toward your grade:

- In-lecture participation
- In-studio assessments, coupled to group worksheet activities (graded partly on participation and partly on correctness)
- Weekly homework assignments
- Interactive e-book
- Labs

Even if you have an existing Top Hat subscription, there will be an extra fee for Top Hat for our course because of everything we are doing with it. At the start of the summer term, you will get an e-mail invitation to join your PY105 section on Top Hat.

Warning - prices on Top Hat are often higher than shown below, but if you click through to the final payment page it should show a discount to one of the prices below.

All students need both a Top Hat subscription (Options 1 through 3 in the table below), plus a \$20 e-Book access fee.

Top Hat pricing options	Price (with tax extra)
<u>Option 1</u> : You do not have an active Top Hat subscription: one semester Top Hat subscription (one semester includes both summer sessions)	\$26
<u>Option 2</u> : You do not have an active Top Hat subscription: one year Top Hat subscription (this option for those planning to take PY106 during the academic year); Do not choose this option if you are taking PY105 and PY106 this summer	\$40
<u>Option 3</u> : You have an active Top Hat subscription	\$0
PY105 e-Book access fee	\$20

Getting the most out of Top Hat

Homework: You have five chances to submit each answer on each online homework assignment. Use your submissions wisely. Note that you can submit the answers to each question individually - you do not need to fill in answers for the whole assignment first. Each time you submit, Top Hat tells you whether you are correct or incorrect, and then (on the homework) you get more chances to correct anything you got wrong.

Things to keep in mind when using Top Hat:

- Start early.
- Come to office hours for help.
- Feel free to work together with other students, but try to do as much as you can on your own.
- Do not hit the refresh button on your browser - that can count as a submission.

In general, Top Hat expects numerical answers to be within 1% of the correct answer, so do not round off until the very end and use at least three significant figures in your answers.