Boston University
PY105 Summer I 2024
Physics I

Instructor: Paul Trunfio
Office: SCI 204-C
Email: trunfio@bu.edu – put **PY105** in the subject heading; but a private message on Piazza is preferrable
Phone: 617-353-9458

Teaching Fellows: Mehmet Dede, Preteek Khatkar, Grant McNamara, Anastasiia Novikova, Mika Phillips, Long-Hin Tang

Course Facilitator: Jackson Rozells **Learning Assistants**: Lia Bao & Salvatore Cordova

Note you can contact any TF or LA or all instructors privately through Piazza (see below)

A1 Lecture & Studio: Mon/Tue/Wed/Thu 10:30 am – 12:45 pm (Room: SCI B23)
A3 (Lab): Wed 1 pm – 3 pm (Room: SCI 134) ^^ See schedule below (meets Mon in Week 6)
A4 (Lab): Wed 1 pm – 3 pm (Room: SCI 136) *The registration page lists labs as Mon/Wed, but in*
A5 (Lab): Wed 3 pm – 5 pm (Room: SCI 134) *practice we will have one lab meeting per week*
A6 (Lab): Wed 3 pm – 5 pm (Room: SCI 136) *(the Monday time will be optional extra help)*

Office Hours (SCI 202): Office hours during weekdays will be held in the physics resource room and adjacent spaces. The spaces are set up so that you can work together and ask for help as needed. The schedule is shown in the table below. The resource room is open outside of the office hours times for group collaboration. Unless otherwise announced, weekend office hours will be held online at: https://bostonu.zoom.us/my/buphysics/

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, 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 when they are scheduled. It is to your advantage to participate during class because your active participation will help you grasp concepts and develop problem solving skills, plus counts 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 are happy to help by answering questions but, continuing the soccer analogy, think of us as coaches. You may not always get the correct answer, but that's okay, because learning from 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. Similarly, you are not allowed to post any course material to any artificial intelligence system. All students are expected to refrain from use of AI (e.g., GenAI, ChatGPT, etc.) for all work in this course. College is a space for learning to think and developing skills, and this course is specifically a space for learning skills, which includes writing and argumentation. In addition, the course material is the professor's creative work, and you have no right to upload that work to any AI systems or anywhere else.

PY105 – Physics I – Summer 2024 Schedule

Week	Date	Studio Class (SCI B23) M/T/W/R 10:00a - 12:45p (A1)	Homework	Studio Activities	Labs (SCI 134/136) W 1-3p (A3/A4); W 3-5p (A5/A6)	Office Hours (SCI 202 unless noted)
1	5/21 Tue	L-01 Physical Laws, Vectors & Measurement		WS-01 + Measurements Mini-Lab		1-3p
	5/22 Wed	L-02 1D Kinematics & Acceleration		WS-02 & WS-03	Forces	9-945a, 1-2p, 3-4p
	5/23 Thu	L-03 Newton's Laws & 1D Forces	**HW #1**	WS-04 & WS-05		9-945a, 1-3p
	5/24 Fri					10a-12p
	5/25 Sat					11a-12p (Zoom)
	5/26 Sun					4-5p (Zoom)
2	5/27 Mon	**No Class - Memorial Day**	**HW #2**			
	5/28 Tue	Discussion (10a - 11:15a) | e-Book 1		**Quiz #1 (SCI 113) 11:30a - 12:30p**		
	5/29 Wed	L-04 2D Kinematics & Projectile Motion		WS-06 & WS-07	Projectiles	9-945a, 1-2p, 3-4p
	5/30 Thu	L-05 Friction	**HW #3**	WS-08		9-945a, 1-3p
	5/31 Fri*	L-06 Newton's Applications		WS-9 & Acceleration Lab		9-945a, 1-3p
	6/1 Sat					11a-12p (Zoom)
	6/2 Sun		**HW #4**			4-5p (Zoom)
3	6/3 Mon	Discussion (10a - 11:15a) | e-Book 2		**Quiz #2 (SCI 113) 11:30a - 12:30p**		
	6/4 Tue	L-07 Circular Motion		WS-11		9-945a, 1-3p
	6/5 Wed	L-08 Impulse & Momentum		WS-12 & WS-12.5	Momentum	9-945a, 1-2p, 3-4p
	6/6 Thu	L-09 Work & Energy	**HW #5**	WS-13		9-945a, 1-3p
	6/7 Fri					10a-12p
	6/8 Sat					11a-12p (Zoom)
	6/9 Sun		**HW #6**			4p-5p (Zoom)
4	6/10 Mon	Discussion (10a - 11:15a) | e-Book 3		**Quiz #3 (SCI 113) 11:30a - 12:30p**		
	6/11 Tue	L-10 Energy Conservation		WS-14		9-945a, 1-3p
	6/12 Wed	L-11 Energy Conservation & Collisions		WS-15	Energy	9-945a, 1-2p, 3-4p
	6/13 Thu	L-12 Torque and Equilibrium	**HW #7**	WS-16 & WS-16.5		9-945a, 1-3p
	6/14 Fri					10a-12p
	6/15 Sat					11a-12p (Zoom)
	6/16 Sun		**HW #8**			4-5p (Zoom)
5	6/17 Mon	Discussion (10a - 11:15a) | e-Book 4		**Quiz #4 (SCI 113) 11:30a - 12:30p**		
	6/18 Tue	L-13 Buoyancy & Fluid Statics		WS-18, WS-19 & Fluids Lab		9-945a, 1-3p
	6/19 Wed	**No Class - Juneteenth**				
	6/20 Thu	L-14 Fluid Dynamics & Viscosity		WS-20 & WS-20.5		9-945a, 1-3p
	6/21 Fri					10a-12p
	6/22 Sat					11a-12p (Zoom)
	6/23 Sun		**HW #9**			4-5p (Zoom)
6	6/24 Mon	L-15 Temperature, Heat & Ideal Gases		WS-22 & WS-24	Calorimetry	9-945a, 1-2p, 3-4p
	6/25 Tue	L-16 Thermodynamic Processes		WS-26 & WS-27		9-945a, 1-3p
	6/26 Wed	L-17 Thermodynamic Cycles	**HW #10**	WS-28		9-945a, 1-3p
	6/27 Thu	Discussion (10a - 11:30a) | e-Book 5		**Quiz #5 (SCI 113) 11:30a - 12:30p**		

*** = Friday May 31 is a substitute Monday schedule**

Notes: (1) all homework assignments due by 10 pm on due date (see below), (2) e-Book assignments due 15 minutes before each quiz, (3) all weekly quizzes will begin at 11:30 am in SCI 113, (4) each worksheet has a brief assessment due immediately after studio class, (5) each pre-lab is due by end of studio time on day of lab and each lab is due by 10 pm on day of lab

Course Components:

1. **Studio Class - Mon/Tue/Wed/Thu 10:00 am-12:45 pm (A1) in SCI B-23**: *In practice, however, our studio classes will likely end earlier if we get through our work*. Studio classes will generally consist of a short lecture, introducing physics concepts including simulations and physical demonstrations. The bulk of studio time will be collaboration with 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, with 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. Full solutions for the worksheet will be posted shortly thereafter. *Note that we will follow a different schedule on Mondays during a quiz day which will be a "discussion" focused on review of concepts and answering any questions you have prior to the quiz.*

2. **Laboratory - Wed 1:00-3:00 pm (A3/A4 in SCI 134/136) and Wed 3:00-5:00 pm (A5/A6 in SCI 134/136)**: *Note that we will not have any lab sessions on Mondays with the exception of the final week (allowing us to schedule one lab period per week and to not have anything extra scheduled on a quiz day).* There are 8 labs in this course (3 of which are during studio time). The labs are designed to complement and reinforce the concepts you are learning by giving you a hands-on authentic experience. You will work collaboratively on the lab activity, submit a lab report consisting of data collection, analysis, and some questions. All labs are assigned on Top Hat, most have a pre-lab that we suggest you complete before the lab, however both the pre-lab and lab are both **due on Top Hat at 10 pm on the day the lab is held.**

Course Resources Overview:

- Course postings, worksheets, calendar, announcements and discussion board: **piazza.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**
- Weekend office hours and virtual appointments: **bostonu.zoom.us/my/buphysics/**

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** – **piazza.com/bu/summer2024/py105** – Piazza is our course homepage and contains all course information (including this syllabus), lecture notes, 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. With all PY105 students and teaching staff monitoring the Piazza site, this should be the best way to get questions answered quickly.
    - **Please do not post questions of a personal or sensitive nature on the public message board**. Piazza allows for direct private posts for that. 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 or 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.

Course Grade: Your letter grade will be assigned on the basis of the total score you accumulate throughout the course. By staying engaged, you can accumulate points for many of these factors. Homework is weighted and the lowest quiz score will have a lower weighting (see below). Each factor will contribute as follows:

- Studio worksheets & Lecture Participation: 12%
- Homework Assignments: 16% - based on 91% of possible total points
- e-Book Assignments: 5%
- Labs: 12%
- Quizzes: 55% - five quizzes, lowest scoring quiz will be least weighted and all others 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:

- Thursday, May 30, 2024: Last day to register/add the course
- Thursday, May 30, 2023: Last day to drop without a "W" grade
- Thursday, June 13, 2023: 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/

Quizzes (all held in SCI 113): There will be five quizzes, spaced at the end of each unit of instruction. Quizzes are designed to be 40 minutes in length but everyone can take up to an hour. The schedule:

Quiz 1: Tuesday, May 28, 11:30 am – 12:30 pm (Classes 1-3, Labs 1-2, e-Book 1, HW #1-2)
Quiz 2: Monday, June 3, 11:30 am – 12:30 pm (Classes 4-6, Lab 3-4, e-Book 2, HW #3-4)
Quiz 3: Monday, June 10, 11:30 am – 12:30 pm (Classes 7-9, Lab 5, e-Book 3, HW #5-6)
Quiz 4: Monday, June 17, 11:30 am – 12:30 pm (Classes 10-12, Lab 6, e-Book 4, HW #7-8)
Quiz 5: Thursday, June 27, 11:30 am – 12:30 pm (Classes 13-16, Labs 7-8, e-Book 5, HW #9-11)

Each quiz will have an announcement and details posted to Piazza the week prior, along with an equation sheet, and practice problems with a review. All quizzes are paper-based. **The lowest scoring quiz will be least weighted.**

Homework: Homework consists of twice weekly problem sets on Top Hat as well as electronic book (e-Book) problems, both of which are aimed at helping you build problem solving skills. Consistent with our philosophy of learning from mistakes, we will base your final homework score on obtaining 91% of the maximum possible points (which is equivalent to dropping one assignment).

(1) Homework Assignments: 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 the unit quiz. **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 or open study in SCI 202). **Each assignment is due at 10 pm according to this schedule**:

For Quiz 1: HW #1: Thursday, May 23 | HW #2: Monday, May 27
For Quiz 2: HW #3: Thursday, May 30 | HW #4: Sunday, June 2
For Quiz 3: HW #5: Thursday, June 6 | HW #6: Sunday, June 9
For Quiz 4: HW #7: Thursday, June 13 | HW #8: Sunday, June 16
For Quiz 5: HW #9: Sunday, June 23 | HW #10: Wednesday, June 26

(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 a few incorrect answers, 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. This should help you build a routine.

Laboratory Experiments: All labs are assigned on Top Hat. All but three (as noted) have a pre-lab that is due by the end of the studio class on the day the lab is held. The lab itself is **due on Top Hat on by 10 pm on the evening the lab is held**. The labs are designed such that they can be fully completed during your scheduled lab time (i.e., you should not need time beyond the lab period, but it is there in case you need it). Lab schedule is as follows:

Lab 1: Tuesday, May 21: Measurements (no pre-lab, shortened lab, held during studio time)
Lab 2: Wednesday, May 22: Forces Between Carts
Lab 3: Wednesday, May 29: Projectile Motion
Lab 4: Friday, May 31: Constant Acceleration (no pre-lab, shortened lab, held during studio time)
Lab 5: Wednesday, June 5: Momentum
Lab 6: Wednesday, June 12: Energy
Lab 7: Tuesday, June 18: Fluids (no pre-lab, shortened lab, held during studio time)
Lab 8: Monday, June 24: 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)
Option 1: You do not have an active Top Hat subscription: one semester Top Hat subscription (one semester includes both summer sessions)	$26
Option 2: 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
Option 3: 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 corrrect 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.