General Physics I

Class code
PHYS-UA 9011 – 100 (Lec)
PHYS-UA 9011 – 101 (Lab)
PHYS-UA 9011 – 102 (Rec)

Instructor Details
Dr Quentin Roper
quentin.roper@nyu.edu

Consultation by Appointment
Please allow at least 24 hours for your instructor to respond to your emails.

Class Details
Fall 2017

General Physics I

Wednesday 9:00am – 12:00pm (Lec)
6 September to 13 December
Room 304
NYU Sydney Academic Centre

Wednesday 12:30 – 1:30pm (Rec)
13 September to 13 December
Room 304
NYU Sydney Academic Centre

Thursday 9:00 – 11:00am (Lab)
7 September to 7 December
UTS Science Lab CB04.03.510 (Building 4, level 3, room 510).
Building 4, 745 Harris Street, Ultimo, NSW 2007

Prerequisites
None

Class
This course is a serious introduction to physics for students who have high school algebra, geometry, and trigonometry at their fingertips, and have had, or are taking calculus. Calculus
Description
will be used in class but sparingly on exams. The algebra, geometry, and trig are absolutely essential. If some time has elapsed since your last math course, or you feel a lack of confidence in this area, you are strongly urged to study math intensively before we get too deeply into the physics course. Topics include kinematics and dynamics of particles; momentum, work, and energy; gravitation; circular, angular, and harmonic motion.

Desired Outcomes
By taking this course you will develop a basic understanding of motion in one, two and three dimensions, as well as forces, momentum, centripetal motion, and select topics in thermal physics. You will develop a conceptual understanding of the underlying physical principles such as Newton’s Laws, moments of inertia, and sound, apply this to specific situations in kinematics and acoustics. You will also be able to undertake calculations and analyse the mentioned topics quantitatively. The overall outcome is a basic understanding of classical mechanics and thermal physics in the many ways in which it manifests itself.

Assessment Components

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Percentage</th>
<th># Dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perusall Assignments</td>
<td>5%</td>
<td>4 Lowest</td>
</tr>
<tr>
<td>Learning Catalytics Assignments</td>
<td>10%</td>
<td>4 Lowest</td>
</tr>
<tr>
<td>MasteringPhysics Assignments</td>
<td>10%</td>
<td>Lowest</td>
</tr>
<tr>
<td>Lab</td>
<td>20%</td>
<td>Lowest</td>
</tr>
<tr>
<td>Exam 1</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Exam 2</td>
<td>10%</td>
<td>No exams dropped</td>
</tr>
<tr>
<td>Exam 3</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
<td></td>
</tr>
</tbody>
</table>

Failure to submit or fulfill any required course component will result in failure of the class.

For this course your total numerical score, calculated from the components listed above, is converted to a letter grade without rounding.

Extra Credit: Site policy does not allow grading of work outside of the assignments included in the syllabus. The final grade will only be calculated from the assessment components listed here and no other work, whether additional or substituted, is permitted.

Exams (55%)  
There will be three exams during the semester and one cumulative final examination. The four exams will be based on the homework, readings, and lectures. All examinations are in multiple-choice format. Both quantitative and conceptual questions will appear on the examinations, as this reflects the content of the course. A formula sheet will be provided with the exam. You will need to bring a calculator to all exams. Sharing calculators with other students during examinations is not allowed. You may not use a cell-phone, or any other
communication device, during the exams.

Exam Replacement Policy: The grade on the final exam will replace your lowest in-class midterm exam provided that your final exam score is higher (on a percentage basis). In other words, your lowest midterm score will become equal to your final exam score provided that your final is higher.

**Laboratory Sessions (20%)**

Laboratory Experiment Descriptions can be found by going to:

The laboratory grade will be based on an average over all labs, but the lowest lab grade will be dropped before the average is calculated. Any lab missed without an excused absence counts as a zero. There are no make-up sessions for missed laboratories. It is important to bring a calculator and your laboratory experiment description to the laboratory sessions. Details will be provided about the process for handing in lab reports.

If you miss more than two lab experiments or fail to hand in more than two reports, your grade for the course will be and F or an I (assuming that you are passing the other components of the course and that you provide medical documentation to explain your absence). To make up the lab requirement, you will have to complete the entire set of labs, not just the ones you missed. This can be done in the following summer session or in the next academic year, space permitting.

**Electronic Learning Resources**

We will use three cloud-based learning resources: MasteringPhysics (MP), Perusall and Learning Catalytics (LC). On MP you will find the, typically, weekly homework to do outside of class. Perusall transforms the text to a place you can read, and engage fellow students in understanding and overcome inevitable confusion that accompanies learning. LC is the system we will use for you to work with your fellow students on problems in class. Assignments on MasteringPhysics, Perusall and Learning Catalytics are computer-graded.

**MasteringPhysics Assignments (10%) Due 9pm Tuesday, the day before class, each week.**

MasteringPhysics is a homework and tutorial system, providing feedback to your answers, and extensive hints for many problems. Most of the problems you will see on MP are conceptual, requiring input in a variety of forms to accommodate the type of problem, whether it be a ranking, sorting, graphing, vector-drawing, symbolic or numeric. Typically, you will have one assignment per week. Completing the assignment before the posted deadline is required to receive credit.

You are required to purchase access to MasteringPhysics. Access homework by going to [www.pearsonmylabandmastering.com](http://www.pearsonmylabandmastering.com). Alternatively you can access the systems via [www.masteringphysics.com](http://www.masteringphysics.com). The MasteringPhysics course ID for the Fall 2017 semester of
General Physics I is MPROPER92510. You will not be able to access homework without this course ID.

Important: When you register for MasteringPhysics,
1. enter your NetID when you are prompted to enter a Student ID and
2. enter your NYU email address.
Failure to do these two steps will result in your homework not counting towards your grade.

Your first assignment is called “Introduction to MasteringPhysics.” While it will not contribute to your grade, it is strongly recommended that you complete this assignment.

A list of the top questions from students can be found by going to the following web page: https://www.pearsonmylabandmastering.com/northamerica/masteringphysics/students/support/top-questions/index.html

In particular, you should view the following two videos on registration and grading. http://www.masteringsupport.com/videos/registration_tips/registration_tips.html http://www.masteringsupport.com/videos/understand_grading/understand_grading.html

You must check that your computer is set up properly to use MasteringPhysics. You will find the following web page useful in assisting you with this task: http://www.pearsonmylabandmastering.com/northamerica/masteringphysics/students/support/system-requirements/index.html

Learning Catalytics Assignments (10%)
Learning Catalytics is a tool to manage work in and out of the classroom. It provides a way to deliver problems to work on, collaboratively, during class, while providing real-time compilation of results. Every class will include problems for you to work on with your neighbours. You must bring a laptop, tablet or smartphone to participate in class.

Access is included in your purchase with MasteringPhysics. After you arrive in the classroom, log onto www.pearsonmylabandmastering.com and click on the Learning Catalytics button. Once completed, you can join the running session for that day’s class.

Perusall Annotations (5%) Due 9pm Tuesday, the day before class, each week.
Perusall is where you can prepare for each class by reading the assigned material. But it also extends the reading assignment by providing a mechanism for you to annotate the text with questions and comments. You can start a new thread by making a comment or asking a question, or contribute to a pre-existing thread, with answers to questions, new questions or comments. Doing the reading is an important component of preparing for the class participation you will engage in during lectures. One reason for using Perusall is that it can help you prepare for class. The better prepared for class you are, the smaller the chance that you will find you did not have sufficient time to work on Learning Catalytics problems in class.
You are required to purchase access to Perusall by logging into www.persuall.com and entering the access code PHYSICS-0462 to enrol in the course. Access will include an etext version of University Physics, 14th global edition, by Hugh Young and Roger Freedman.

Perusall helps you master readings faster, understand the material better, and get more out of your classes. To achieve this goal, you will be collaboratively annotating the textbook with others in your class. The help you’ll get and provide your classmates will get you past confusions quickly, and will make the process more fun. While you read, you’ll receive rapid answers to your questions, help others resolve their questions (which also helps you learn), and advise the instructor how to make class time most productive.

You can start a new annotation thread in Perusall by highlighting text, asking a question, or posting a comment; you can also add a reply or comment to an existing thread. Each thread is like a chat with one or more members of your class. Your goals in annotating each reading assignment are to stimulate discussion by posting good questions or comments and to help others by answering their questions.

Research shows that by annotating thoughtfully, you’ll learn more and get better grades; so here’s what “annotating thoughtfully” means: Effective annotations deeply engage points in the readings, stimulate discussion, offer informative questions or comments, and help others by addressing their questions or confusions. To this end your annotations are evaluated on the basis of quality, timeliness, quantity, and distribution:

**Quality** The reading replaces the lectures so that you can engage in more useful activities in class. Therefore it is important that you read the text thoughtfully and attempt to lay the foundation for the work in class. Each of your annotations is assigned one of the following evaluations:

2 = Demonstrates thorough and thoughtful reading AND insightful interpretation of the reading
1 = Demonstrates reading, but no (or only superficial) interpretation of the reading
0 = Does not demonstrate any thoughtful reading or interpretation

See the examples on the next page to see the quality criterion applied to sample annotations.

**Quantity** We compute your overall score using your 7 highest-quality annotations for each assignment, so be sure to write at least this number to ensure the best score. Because we want you to engage in a natural conversation with your classmates through your annotations, your overall score only depends only on these 7 highest-quality annotations. So, as long as you have 7 high-quality annotations, a brief response to another student (e.g., answering “Yes” to what is just a yes or no question) won’t hurt your overall score, even though by itself that response is nominally a “0.”
Timeliness The work done in class depends on you having done the reading in advance, so completing the reading and posting your annotations before the posted deadline is required to receive credit.

Distribution To lay the foundation for understanding the in-class activities, you must at least familiarize yourself with each assignment in its entirety. Annotating only part of the text and/or failing to distribute your annotations throughout the document lowers your overall score.

Overall Evaluation: You will receive an overall evaluation for each reading assignment based on the criteria above as follows: 3 = exceptional (rarely given), 2 = meets expectations, 1 = needs improvement, 0 = insufficient

Assessment Expectations

Grade A: Excellent work showing a thorough knowledge and understanding of the topics, with excellent use of scientific language, detailed analysis and clear logical explanations, showing insight, independent, original thought and reasoning.

Grade B: Good work with good general knowledge and understanding of the topics, accurate use of scientific language, good general analysis and coherent explanations showing some independent reasoning, reading and research.

Grade C: Satisfactory work, broadly correct both factually and analytically, with some explanation and reasoning: the work will typically demonstrate a basic understanding of the topic.

Grade D: Passable work, showing a general, superficial knowledge and understanding of the topic, lacking satisfactory use of scientific language or adequate analysis.

Grade F: Unsatisfactory work in all criteria. The minimum requirements for the course have not been met.

Grade Conversions

For this course your total numerical score, calculated from the components listed above, correspond to the following letter grades:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Numerical Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90 to 100</td>
</tr>
<tr>
<td>A-</td>
<td>86 to &lt; 90</td>
</tr>
<tr>
<td>B+</td>
<td>82 to &lt; 86</td>
</tr>
<tr>
<td>B</td>
<td>72 to &lt; 82</td>
</tr>
<tr>
<td>B-</td>
<td>68 to &lt;72</td>
</tr>
<tr>
<td>C+</td>
<td>64 to &lt;68</td>
</tr>
<tr>
<td>C</td>
<td>54 to &lt;64</td>
</tr>
</tbody>
</table>
Assignment (excluding in-class presentations and exams) must be submitted electronically via NYU Classes. It is the student’s responsibility to confirm that the work has been successfully been uploaded. In the unlikely event that a submission to Classes fails, students must immediately submit the work to the Academic Programs Coordinator via email before the original submission deadline accompanied by an explanation of the issue. All in-class presentations and exams must be completed during the scheduled class time. An assessment component is considered completed when the student has met all the terms for that assessment component as outlined by the instructor.

An assessment component completed after the deadline without an agreed extension receives a penalty of 2 points on the 100-point scale (for the assignment) for each day the work is late. Work completed beyond five weekdays after the due date without an agreed extension receives a mark of zero, and the student is not entitled to feedback for that piece of work. Because failure to submit or fulfil any required assessment component will result in failure of the course, it is crucial for students to complete every assignment even when it will receive a mark of zero.

The academic standards of New York University apply to all coursework at NYU Sydney. NYU Sydney policies are in accordance with New York University’s plagiarism policy. The presentation of another person’s words, ideas, judgment, images or data as though they were your own, whether intentionally or unintentionally, constitutes an act of plagiarism.

It is a serious academic offense to use the work of others (written, printed or in any other form) without acknowledgement. Cases of plagiarism are not dealt with by your instructor. They are referred to the Director, who will determine the appropriate penalty (up to and including failure in the course as a whole) taking into account the codes of conduct and academic standards for NYU’s various schools and colleges.

Study abroad at Global Academic Centres is an academically intensive and immersive experience, in which students from a wide range of backgrounds exchange ideas in discussion-based seminars. Learning in such an environment depends on the active participation of all students. And since classes typically meet once or twice a week, even a single absence can cause a student to miss a significant portion of a course. To ensure the integrity of this academic experience, class attendance at the centres is mandatory, and unexcused absences will affect students’ semester grades. The class roster will be marked at
the beginning of class and anyone who arrives after this time will be considered absent. Students are responsible for making up any work missed due to absence.

For courses that meet once a week, one unexcused absence will be penalised by a two percent deduction from the student’s final course grade. For courses that meet two or more times a week, the same penalty will apply to two unexcused absences. Repeated absences in a course may result in failure.

Faculty cannot excuse an absence. Requests for absences to be excused must be directed to the Academic Programs Coordinator. Students must provide appropriate documentation for their absence. In the case of illness, students must contact the Academic Programs Coordinator on the day of absence. They must provide medical documentation to Academic Programs Coordinator within three days of the absence in order to be medically excused. The note must include a medical judgement indicating that the student was unfit to attend class/work on the specific day or dates of the absence. Faculty will be informed of excused absences by the Academic Programs staff.

Classroom Expectations

This is a seminar subject and requires the active participation of all students. It also requires engaged discussion, including listening to and respecting other points of view. Your behaviour in class should respect your classmates’ desire to learn. It is important for you to focus your full attention on the class, for the entire class period.

- Arrive to class on time.
- Once you are in class, you are expected to stay until class ends. Leaving to make or take phone calls, to meet with classmates, or to go to an interview, is not acceptable behaviour.
- Phones, digital music players, and any other communications or sound devices are not to be used during class. That means no phone calls, no texting, no social media, no email, and no internet browsing at any time during class.
- Laptop computers and tablets are not to be used during class except in rare instances for specific class-related activity expressly approved by your instructor.
- The only material you should be reading in class is material assigned for that class. Reading anything else, such as newspapers or magazines, or doing work from another class, is not acceptable.
- Class may not be recorded in any fashion – audio, video, or otherwise – without permission in writing from the instructor.

Diversity, Inclusion and Equity

NYU is committed to building a culture that respects and embraces diversity, inclusion, and equity, believing that these values – in all their facets – are, as President Andrew Hamilton has said, “...not only important to cherish for their own sake, but because they are also vital for advancing knowledge, sparking innovation, and creating sustainable communities.” At NYU Sydney we are committed to creating a learning environment that:
● fosters intellectual inquiry, research, and artistic practices that respectfully and rigorously take account of a wide range of opinions, perspectives, and experiences; and
● promotes an inclusive community in which diversity is valued and every member feels they have a rightful place, is welcome and respected, and is supported in their endeavours.

Religious Observance

Students observing a religious holiday during regularly scheduled class time are entitled to miss class without any penalty to their grade. This is for the holiday only and does not include the days of travel that may come before and/or after the holiday. Students must notify their professor and the Academic Programs Coordinator in writing via email one week in advance before being absent for this purpose.

Provisions to students with Disabilities

Students with disabilities who believe that they may need accommodations in a class are encouraged to contact the Moses Centre for Students with Disabilities at (212) 998-4980 as soon as possible to better ensure that such accommodations are implemented in a timely fashion. For more information, see Study Away and Disability.

Required Texts

You will need to purchase three eLearning tools: MasteringPhysics, Perusall, Learning Catalytics; Persusall includes the e-text of University Physics, 14th global edition, by Young and Freedman. Purchase of MasteringPhysics will include access to Learning Catalytics.

Please note that if you already have a copy of the 14th edition of University Physics, or you purchase a copy from a third party source, that does not mean you have the access code for MasteringPhysics. You can purchase the access code by going to www.masteringphysics.com.
<table>
<thead>
<tr>
<th>Week (Lec/Rec/Lab)</th>
<th>Lecture/Exams</th>
<th>Readings (Chap)</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Vectors</td>
<td>1, 2</td>
<td>Check-in and Safety Orientation</td>
</tr>
<tr>
<td>Wed 6 Sep</td>
<td>Motion Along a Straight Line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Recitation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 2</td>
<td>Motion in 2 or 3 Dimensions</td>
<td>3</td>
<td>Motion 1</td>
</tr>
<tr>
<td>Wed 13 Sep</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start recitations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 3</td>
<td>Newton's Laws of Motion</td>
<td>4</td>
<td>Motion 2</td>
</tr>
<tr>
<td>Wed 20 Sep</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 4</td>
<td>Applying Newton's Laws</td>
<td>5</td>
<td>Equilibrium of a Particle</td>
</tr>
<tr>
<td>Wed 27 Sep</td>
<td>Exam 1 (10%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 5</td>
<td>Work and Kinetic Energy</td>
<td>6</td>
<td>Newton's 2nd Law</td>
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<tr>
<td>Wed 4 Oct</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 6</td>
<td>Potential Energy and Energy Conservation</td>
<td>7</td>
<td>No Lab</td>
</tr>
<tr>
<td>Wed 11 Oct</td>
<td></td>
<td></td>
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</tbody>
</table>

*Mid Semester Fall Break: 16 – 20 October (Week 7)*

<p>| Week 8              | Momentum, Impulse and Collisions     | 8              | Work-Energy                         |
| Wed 25 Oct          |                                      |                |                                     |
| Week 9              | Rotation of Rigid Bodies             | 9              | Collisions in One Dimension         |
| Wed 1 Nov           | Exam 2 (10%)                         |                |                                     |
| Week 10             | Dynamics of Rotational Motion        | 10             | Centripetal Force                   |
| Wed 8 Nov           |                                      |                |                                     |
| Week 11             | Periodic Motion                      | 14             | Ballistic Pendulum                  |
| Wed 15 Nov          |                                      |                |                                     |
| Week 12             | Mechanical Waves                     | 15             | Conservation of Energy              |
| Wed 22 Nov          |                                      |                |                                     |</p>
<table>
<thead>
<tr>
<th>Week (Lec/Lab/Rec)</th>
<th>Lecture Topic</th>
<th>Readings (Chap)</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 13</td>
<td>Sound and Hearing</td>
<td>16</td>
<td>Oscillation of a String</td>
</tr>
<tr>
<td>Wed 29 Nov</td>
<td>Exam 3 (10%)</td>
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<td></td>
</tr>
<tr>
<td>Week 14</td>
<td>Fluid Mechanics</td>
<td>12</td>
<td>Resonance Tube</td>
</tr>
<tr>
<td>Wed 6 Dec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 15</td>
<td>Gravitation Revision</td>
<td>13</td>
<td>No Lab</td>
</tr>
<tr>
<td>Wed 13 Dec</td>
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</tbody>
</table>

**Final Exam (25%): Wednesday 20 December, 9:30 – 11:30am**

**Your Instructor**

Dr. Quentin Roper (Ph. D., University of Iowa) is an astronomer who specialises in high energy astrophysics. His research interests include X-ray binaries, astrostatistics, supernovae and supernova remnants. He has incorporated non-gaussian likelihood analysis to improve the usability of low surface brightness, low resolution imaging spectroscopy, particularly to analyse the composition of supernova remnants. He most recently has been using archival data taken from the Chandra X-ray Telescope to constrain the kinematics of young supernova remnants and derive properties of the remnant's progenitor system.
4.1 Friction

Picture a block of wood sitting motionless on a smooth wooden surface. If you give the block a shove, it slides some distance but eventually comes to rest. Depending on the smoothness of the block and the smoothness of the wooden surface, this stopping may happen sooner or later.

Similarly, the duration covered by the velocity-versus-time graph, the velocity decreases as the block slides over ice is hardly noticeable. The block slides easily over ice because there is very little friction between the two surfaces. The effect of friction is to bring two objects to rest with respect to each other—in this case the wooden block and the surface it is sliding on. The less friction there is, the longer it takes for the block to come to rest.

Another advantage of using such carts is that the track constrains the motion to being along a straight line. We can then use a high-speed camera to record the cart's position at various instants, and from that information determine its speed and acceleration.

4.1 (a) Are the accelerations of the motions shown in Figure 4.1 constant? (b) For which surface is the acceleration largest in magnitude?

4.2 Inertia

We can discover one of the most fundamental principles of physics by studying how the velocities of two low-friction carts change when the carts collide. Let's first see what happens with two identical carts. We call these standard carts because we'll use them as a standard against which to compare the motion of other carts. First, we put one standard cart on the low-friction track, and make sure it doesn't move. Next, we place the second cart on the track some distance from the first, gently give it a slight push toward the first. The two carts collide, and the collision changes the velocities of both.