*We recognize and acknowledge that McMaster University meets and learns on the traditional territories of the Mississauga and Haudenosaunee nations, and within the lands protected by the “Dish With One Spoon” wampum, an agreement amongst all allied Nations to peaceably share and care for the resources around the Great Lakes.*

# PHYSICS 1A03 – Introductory Physics

# 2022 Winter Term

|  |  |  |  |
| --- | --- | --- | --- |
| Section | C0 1 | C0 2 | C0 3 |
| Instructor | Dr. Miranda Schmidt | Dr. An-Chang Shi | Dr. Rob Cockcroft |
| Contact Info | [schmim10@mcmaster.ca](mailto:gaulin@mcmaster.ca) | [shi@mcmaster.ca](mailto:shi@mcmaster.ca) | [cockcroft@mcmaster.ca](mailto:cockcroft@mcmaster.ca) |
| Lectures (tutorial) | Wednesday | Monday | Tuesday |
| Office Hours | Friday | Wednesday | Thursday |
| Time | 11:30am-12:20pm (Wednesday)  1:30-2:20pm (Friday) | 11:30am-12:20pm | 11:30am-12:20pm |
| Location | MS Teams/JHE 376 | MS Teams/BSB 147 | MS Teams/JHE 376 |

**Course Coordinator:** Sara Cormier |  **E-mail:** [phys1Acoord@physics.mcmaster.c](mailto:physics1Acoord@physics.mcmaster.c)a

## Course Description

PHYS 1A03 is a first course in university physics, taught using examples and applications from many areas of science. The topics we will cover include the concepts of kinematics, force and energy, mechanics, waves and fluids. This offering of PHYS 1A03 in an online/blended format. The course consists of pre-recorded lectures, video modules and live tutorial style lectures. For PHYS 1A03 there are two hours of pre-recorded lectures per week with an accompanying web module and live tutorial style lecture which will happen on Teams or in-person depending on COVID restrictions. In addition, there is also a laboratory component roughly every other week (5 labs in the term, each taking about 2-3 hours to complete).

Laboratory investigations will be in-person (depending on COVID restrictions), with an option to carry out the labs at home. The format in which the course is taught, adapts itself to individual learning preferences because the pace can be chosen by you. The regular lecture component of the course will focus on review of the modules, adding further depth, and applying the physics learned to real-world examples. You will see that the physics learned is not stagnant, rather it is relevant to current research topics — even to current research carried out at McMaster!

The Physics 1A03 Team strives to share our enthusiasm for physics and how widely applicable physics is in areas that range from muscles and body mechanics, to diffusion in a cell, to space exploration and our climate. Physics is not just about sliding boxes on an inclined plane or the tension in a rope. The goal of physics is to understand the way the world works from the tiniest speck of matter to the entire cosmos. Physics is at the intersection of many disciplines (biophysics, medical physics, geophysics, etc.), ties these disciplines together, and bridges them to mathematics. More than anything we hope that by the end of the course you will share our enthusiasm for physics.

## Course Intended Learning Outcomes

PHYS 1A03 will give you a thorough preparation for applying physics concepts to the world around you. The course will prepare you for higher level courses in most areas of Science. Along with other first year science courses, PHYS 1A03 will enhance your ability to think critically and develop problem solving skills. This course is an excellent preparation for medical school and other professional schools. The topics presented in this class, together with those presented in PHYS 1AA3, cover most of the material required for the MCAT. Together, these two courses (PHYS 1A03 and PHYS 1AA3) fulfill the requirements of many Canadian and American medical schools for 2 physics courses with labs.

Students interested in pursuing a degree or a minor in physics might consider taking the PHYS 1C03 and 1CC3 series (Modern Physics for the Chemical and Physical Sciences), since it is a more math- intensive course that can provide an in-depth preparation for a full physics degree. A full physics degree is also completely possible with PHYS 1A03 and 1AA3.

## Course Format (How will you Learn?) & Expectations

The course is organized as follows:

* 2 pre-recorded lectures per week
* 1 online video module per week
* 1 live tutorial style lecture per week (which will be recorded and posted online after lecture)
* 9 online LON-CAPA assignments
* 5 laboratory exercises
* 2 midterm tests
* 1 final exam

## Lab Schedule

Time/Duration: approximately 2 hours | Location: BSB B114/B115 or at home

## Course Website

<http://avenue.mcmaster.ca/>

Log in with your McMaster ID (i.e. your email prefix) and password and select this course. There you will find important communications and all the on-line modules. This course will make extensive use of Avenue to Learn, it is your responsibility to check this frequently. The Avenue to Learn site will have a variety of resources and will be used throughout the term for posting schedules, information, links to other websites, etc.

## Communication

If you wish to communicate with the course coordinator or your professor, you must communicate with your McMaster email account and email their respective emails above. Do not communicate through Avenue to Learn or any other email server as these emails can often end up in spam and go unanswered. MS Teams is also an encouraged and accepted method of communication.

## Materials & Fees

### Required Materials/ Resources

**Textbook (recommended):**

There is *no* required textbook, however, *Physics for the Life, 2nd (or 3rd) Ed.* by Zinke-Allmang and co-authors is an ideal companion to the material presented should you desire a textbook.

**Calculator (required):**

The McMaster Standard Calculator is the recommended and ideal calculator for tests. For details on what the McMaster Standard Calculator is and what models are acceptable please visit:

<https://registrar.mcmaster.ca/exams/requirements/>.

**Lab Kit (required):**

A box containing all of the equipment can be purchased and picked up or shipped from the campus store. All students are required to purchase a kit.

**Lab manual:**

The lab instructions are provided in the lab room and on Avenue to Learn.

**Course notes:**

Full copies of the lecture slides will be posted along with the lecture recordings.

**On-line modules:**

The on-line modules are a major component of the course. Roughly one module per week will be assigned and available from the course Avenue to Learn webpage.

## Virtual Course Delivery

**To follow and participate in virtual classes it is expected that you have reliable access to the following:**

* A computer that meets performance requirements [found here](https://cto.mcmaster.ca/technology-resources-for-mcmaster-students/#tab-content-device-recommendations).
* An internet connection that is fast enough to stream video.
* Computer accessories that enable class participation, such as a microphone, speakers and webcam when needed.

If you think that you will not be able to meet these requirements, please contact [uts@mcmaster.ca](mailto:uts@mcmaster.ca) as soon as you can. Please visit the [Technology Resources for Students page](https://cto.mcmaster.ca/technology-resources-for-mcmaster-students/#tab-content-device-recommendations) for detailed requirements. If you use assistive technology or believe that our platforms might be a barrier to participating, please contact [Student Accessibility Services](https://sas.mcmaster.ca/), [sas@mcmaster.ca](mailto:sas@mcmaster.ca), for support.

## Course Overview and Assessment

### Course Schedule

### Week 1: Jan 10-14

|  |  |
| --- | --- |
| **Topics:** | * Introduction, units and unit conversion, dimensional analysis |
| **Viewings/Class:** | * Lecture 1A and 1B * Module T1M1 – The predictable universe; from measurement to models |
| **Due:** |  |

### Week 2: Jan 17-21

|  |  |
| --- | --- |
| **Topics:** | * Proportionality, vectors, precision and estimation |
| **Viewings/Class:** | * Module T1M1 – The predictable universe; from measurement to models (if not watched in week 1) * Lecture 2A and 2B * Introduction – live lecture (tutorial) |
| **Due:** |  |

### Week 3: Jan 24-28

|  |  |
| --- | --- |
| **Topics:** | * Fermi questions, kinematics |
| **Viewings/Class:** | * Module T1M2 – Precision and estimation * Lecture 3A and 3B * LON-CAPA 1 – live lecture (tutorial) |
| **Due:** | Lab 0 – Monday, January 24th  LON-CAPA assignment 1 – Friday, January 28th |

### Week 4: Jan 31-Feb 4

|  |  |
| --- | --- |
| **Topics:** | * Kinematics, vector and scalars |
| **Viewings/Class:** | * Module T2M1 – Kinematics * Lecture 4A and 4B * LON-CAPA 2 – live lecture (tutorial) |
| **Due:** | LON-CAPA assignment 2 – Friday, February 4th |

### Week 5: Feb 7-11

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| --- | --- |
| **Topics:** | * Forces, free body diagrams, friction, static & dynamic equilibrium |
| **Viewings/Class:** | * Module T2M2 – Forces * Lecture 5A and 5B * Midterm 1 review – live lecture (tutorial) |
| **Due:** | Lab 1 – Monday, February 7th  Midterm 1 – Wednesday, February 9th |

### Week 6: Feb 14-17

|  |  |
| --- | --- |
| **Topics:** | * Work, energy, conservation, conservative forces, potential energy |
| **Viewings/Class:** | * Module T2M3 – Energy * Lecture 6A and 6B * LON-CAPA 3 – live lecture (tutorial) |
| **Due:** | LON-CAPA assignment 3 – Friday, February 18th |

**READING WEEK: FEB 21-25**

### Week 7: Feb 28-Mar 4

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| --- | --- |
| **Topics:** | * Momentum, conservation, collisions, impulse, |
| **Viewings/Class:** | * Module T2M4 – Momentum * Lecture 7A and 7B * LON-CAPA 4 – live lecture (tutorial) |
| **Due:** | Lab 2 – Monday, February 28th  LON-CAPA assignment 4 – Friday, March 4th |

### Week 8: Mar 7-11

|  |  |
| --- | --- |
| **Topics:** | * *Review of Forces, Energy and Momentum* |
| **Viewings/Class:** | * Lecture 8A and 8B * LON-CAPA 5 – live lecture (tutorial) |
| **Due:** | LON-CAPA assignment 5 – Friday, March 11th |

### Week 9: Mar 14-18

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| --- | --- |
| **Topics:** | * Waves, wave equation, boundary conditions, rope, sinusoidal waves |
| **Viewings/Class:** | * Module T3M1 – Wave motion * Lecture 9A and 9B * Midterm 2 – live lecture (tutorial) |
| **Due:** | Lab 3 – Monday, March 14th  Midterm 2 – Wednesday, March 16th |

### Week 10: Mar 21-25

|  |  |
| --- | --- |
| **Topics:** | * Superposition, interference, standing waves, sound |
| **Viewings/Class:** | * Module T3M2 – Superposition and sound * Lecture 10A and 10B * LON-CAPA 6 – live lecture (tutorial) |
| **Due:** | LON-CAPA assignment 6 – Friday, March 25th |

### Week 11: Mar 28-Apr 1

|  |  |
| --- | --- |
| **Topics:** | * Electromagnetic spectrum, interference, reflection, refraction, dispersion, diffraction |
| **Viewings/Class:** | * Module T3M3 – The wave nature of light * Lecture 11A and 11B * LON-CAPA 7 – live lecture (tutorial) |
| **Due:** | Lab 4 – Monday, March 28th  LON-CAPA assignment 7 – Friday, April 1st |

### Week 12: Apr 4-8

|  |  |
| --- | --- |
| **Topics:** | * Fluid statics, pressure, Pascal’s principle, buoyant force, surface tension, capillarity |
| **Viewings/Class:** | * Module T4M1 – Fluid statics * Lecture 12A and 12B * LON-CAPA 8 – live lecture (tutorial) |
| **Due:** | LON-CAPA assignment 8 – Friday, April 8th |

### Week 13: Apr 11-12

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| --- | --- |
| **Viewings/Class:** | * LON-CAPA 9 – live lecture (tutorial) |
| **Due:** | Lab 5 – Monday, April 11th  LON-CAPA assignment 9 – Wednesday, April 13th |

## Evaluation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Assessment | Due Date | Option 1\* | WeightOption 2\* | Option 3\* |
| 9 LON-CAPA Assignments | Throughout the term | 9% | 9% | 9% |
| 5 Labs | Throughout the term | 21% | 21% | 21% |
| Midterm 1 | February 9 | 20% | 20% | 0% |
| Midterm 2 | March 16 | 0% | 20% | 20% |
| Final Exam | TBD | 50% | 30% | 50% |
|  |  |  | 100% |  |

\* Each of the three options will be evaluated and the highest grade option will be used.

### Online LON-CAPA homework (9%)

You will receive online homework assignments via LON-CAPA (“Learning Online Network with Computer Assisted Personalized Approach”) which provides personalized questions. Each question allows for 10 tries. Due dates will be announced on Avenue to Learn and are also on the schedule above. The lowest LON-CAPA assignment grade will be dropped. The McMaster Student Absence Form (MSAF, see “Missed work” below) is accepted for missed homework assignments. The MSAF’d assignment weight will be moved to the final exam.

### Laboratory investigations (21%)

Due to the ongoing COIVD-19 pandemic, all labs can be carried out at home. Labs may be completed individually or in groups of two or three. Each laboratory exercise is designed with basic household items. A lab kit which contains all necessary equipment must be purchased and may be shipped to your home address if needed. The cost of shipping falls to the student. We will be holding optional in-person help for the labs in which TAs will be available to assist with troubleshooting, data acquisition, and analysis. Students may visit the lab room on campus during their scheduled lab time on Mosaic if COVID restrictions allow. All COVID protocols will be followed, and all protocols will be made abundantly clear prior to the scheduled lab times. Note that this format, with the lab kits, allows for maximum flexibility. **Every student will have the opportunity to receive in-person help and collaborate with classmates. And students who choose to perform all labs at home are also free to do so.**

Some of the laboratory exercises are "pencil-and-paper" exercises, in which you will solve a problem that is related to the physics experiment you are to perform. You will then be guided through steps to setup an experiment. You will take measurements, make observations, and produce graphs. The process of applying your physical knowledge to predicting, testing, and verifying is the most important aspect of the laboratory exercises. There will be 5 labs during the semester in addition to a practice lab 0 which is marked only on completion. Lab 0 is worth 1% of your final course grade, the other 5 labs are worth a combined 20% of your final course grade. **The lowest lab grade of the 5 labs will be dropped. So only the top 4 of 5 labs will count towards the 20% course grade.**

If you fail to submit a lab by the due date, there will be a 10% grade deduction per day late to a maximum of 50% deducted (5 days late). Labs that are submitted after 5 days will receive a grade of zero. Note that submitting a McMaster Student Absence Form (MSAF, see “Missed work” below) will extend the deadline of the lab by three days.

We will not be offering lab exemptions for students who have previously taken PHYS 1A03.

### Midterms and Exam (70%)

**Midterm 1:** Wednesday, February 9th, 2022, 7pm

**Midterm 2:** Wednesday, March 16th, 2022, 7pm

**Final Exam:** TBD

The two midterm tests and final exam will be a combination of multiple-choice and short answer questions on Avenue to Learn. You will be tested on the material covered in lectures, labs, on-line modules, and assignments. The midterm tests and exam are to be completed individually without any collaboration or searching for answers on the internet (see Academic Ethics and Collaboration below). If you miss a midterm, in accordance with the marking schemes above, a weight of 0% for that test will *automatically apply and thus you will not need to fill out a McMaster Student Absence Form* (MSAF, see “Missed work” below) or contact your Faculty Office. The final exam is cumulative, but the second midterm will focus on material since the first midterm.

## Requests for Relief for Missed Academic Term Work

[McMaster Student Absence Form (MSAF):](https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/msaf-mcmaster-student-absence-form/) In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”.

For the Faculty of Science, please follow the guidelines located [here](https://science.mcmaster.ca/associatedean/images/Forms/MSAF-Information.pdf).

## Policy Regarding Missed Work

1. It is the students’ responsibility to regularly check the course webpage (Avenue to Learn) for updates and announcements.
2. MSAFs are not needed for missed midterm tests; the grading option with 0% weighting for the missed midterm will automatically apply.
3. MSAFs for missed LON-CAPA assignments will result in the weight of the assignment moving to the final exam.
4. MSAFs for the laboratory exercises will result in an extension of the deadline by three days. Note that the lowest lab grade is dropped, so missing one lab is okay and the missed lab will automatically count as the dropped one.
5. Lab reports that are handed in past the deadline will incur a 10% late penalty per day for a maximum of 50% late marks deducted. After five days a grade of zero will be applied.

## Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact [Student Accessibility Services (SAS](https://sas.mcmaster.ca/)) at 905-525-9140 ext. 28652 or [sas@mcmaster.ca](mailto:sas@mcmaster.ca) to make arrangements with a Program Coordinator. For further information, consult McMaster University’s [*Academic Accommodation of Students with Disabilities*](https://secretariat.mcmaster.ca/app/uploads/Academic-Accommodations-Policy.pdf) policy.

## Physical and Mental Health

For a list of McMaster University’s resources, please refer to the [Student Wellness Centre](https://wellness.mcmaster.ca/).

## Academic Accommodation for Religious, Indigenous Or Spiritual Observances (Riso)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the [RISO](https://secretariat.mcmaster.ca/app/uploads/2019/02/Academic-Accommodation-for-Religious-Indigenous-and-Spiritual-Observances-Policy-on.pdf) policy. Students should submit their request to their Faculty Office ***normally within 10 working days*** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

## Equity, Diversity, and Inclusion

Every registered student belongs in this course. Diversity of backgrounds and experiences is expected and welcome. You can expect your instructor to be respectful of this diversity in all aspects of the course, and the same is expected of you.

The Department of Physics & Astronomy is committed to creating an environment in which students of all genders, cultures, ethnicities, races, sexualities, abilities, and socioeconomic backgrounds have equal access to education and are welcomed and treated fairly. If you have any concerns regarding inclusion in our department, in particular if you or one of your peers is experiencing harassment or discrimination, you are encouraged to contact the Chair, Associate Chair of Undergrad Studies, Undergraduate Advisor (Level I), and/or Undergraduate Advisor (Levels II to IV) (contact details listed [here](https://www.physics.mcmaster.ca/contact/contact-us.html)) or to contact the [Equity and Inclusion Office](https://equity.mcmaster.ca/). You are also always welcome to contact the course coordinator, Sara Cormier ([phys1Acoord@physics.mcmaster.ca](mailto:phys1Acoord@physics.mcmaster.ca)) and/or your professor.

## Courses with An On-Line Element

### Online Statement

McMaster is committed to an inclusive and respectful community. These principles and expectations extend to online activities including electronic chat groups, video calls and other learning platforms.

***Physics 1A03*** uses various on-line elements (e.g. e-mail, Avenue to Learn (A2L), Crowdmark, LON-CAPA, Microsoft Teams, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with Sara Cormier ([phys1Acoord@physics.mcmaster.ca](mailto:phys1Acoord@physics.mcmaster.ca)).

## McMaster University Statement on Inclusivity

The University values integrity, inclusiveness and teamwork, and strives to support the personal and collective growth of the McMaster student community.

These values are foundational to ensuring campus environments – both in-person and virtual –are conducive to personal wellbeing and academic success.

## Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

**It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the [*Academic Integrity Policy*](https://secretariat.mcmaster.ca/app/uploads/Academic-Integrity-Policy-1-1.pdf)*,* located at [https://secretariat.mcmaster.ca/university-policies-procedures- guidelines/](https://secretariat.mcmaster.ca/university-policies-procedures-%20guidelines/)

**The following illustrates only three forms of academic dishonesty:**

* plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
* improper collaboration in group work. This includes labs. The lab that is submitted must be only the work of the group member(s). All members of the group must agree and approve the lab submission. Copying from external sources is not permitted. Collaborating outside of the group is not permitted.
* copying or using unauthorized aids in tests and examinations. In this course the tests and exam are “open book”, you are permitted to use your personal notes including formula sheet, a calculator, and the textbook if you have it. The tests are to be completed individually. You are not permitted to collaborate with others or search for answers on the internet. This includes but is not limited to searching for answers on Google, searching or posting to Chegg, Course Hero, or any website. You cannot post or open any group chats you may be a part of which includes but is not limited to Instagram, Discord, Facebook, MS Teams, or text messages.

Some helpful information can be found [here](https://sscm.mcmaster.ca/).

## Authenticity / Plagiarism Detection

***Some courses may*** use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster’s use of Turnitin.com please go to the [McMaster Office of Academic Integrity's](https://www.mcmaster.ca/academicintegrity/) website.

## Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all our living, learning and working communities. These expectations are described in the [*Code of Student Rights & Responsibilities* (the “Code”).](https://secretariat.mcmaster.ca/app/uploads/Code-of-Student-Rights-and-Responsibilities.pdf) All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students’ access to these platforms.

Additional information about the Code and netiquette can be found [here](https://sscm.mcmaster.ca/the-code/the-code-virtual-communities/).

## Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

**Research Ethics** -N/A

## Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.