WELCOME TO
Physics 103 "The physics of everyday phenomena"

Syllabus, Fall 2021

READ CAREFULLY, ASK QUESTIONS IF CONFUSED

Instructor: Ania Wyczalkowska

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By far the best way to contact me is by e-mail. However, I teach a lot (and have a life) so please keep in mind that my response may not be instantaneous. In particular, on Mondays, Tuesdays and Thursdays I'm teaching for the better part of the day and may not get a chance to read your e-mails till late or till the next day.

I will be checking my e-mail as often as I can and try to get back with you as soon as I can. If the question does not involve anything personal, a better place for it is our discussion board: if you are unsure about something, your classmates may be too and this way they can get the information faster. Moreover, your Learning Assistants will be also able to see your post and respond.

office hours: I will be scheduling on-line sessions on Blackboard Collaborate. The exact time will be announced on Blackboard. If you cannot make the scheduled time and wish to speak with me, please mail me and we'll schedule an appointment.

course website: Blackboard 9 The course is available on Blackboard with your GMU log-in name and password. Select PHYS 103 (see below for lecture and lab sections).

(this is where all course materials from syllabi through homework assignments, lab manuals, projects, handouts to lecture notes will be posted. It is your responsibility to check the website regularly for possible changes and important announcements).

Course Meeting:

lecture: Tuesday and Thursday 12:00 PM - 1:15 PM, Blackboard Collaborate (site: PHYS-103 2021 - lecture)

lab:

Monday	section 206	1:30 PM – 4:10 PM,	Blackboard Collaborate (site: PHYS-103 2021 lab section 6 M 1:30 PM)
	section 204	5:00 PM – 7:40 PM,	Blackboard Collaborate (site: PHYS-103 2021 lab section 4 M 5:00 PM)
Tuesday	section 205	2:30 PM – 5:10 PM,	Blackboard Collaborate (site: PHYS-103 2021 lab section 5 T 2:30 PM)
Thursday	section 207	2:30 PM – 5:10 PM,	Blackboard Collaborate (site: PHYS-103 2021 lab section 7 R 2:30 PM)

Note: there is a **mandatory laboratory component** to this class that is required. ***Make sure that you are registered for both.***

Prerequisite: Students are expected to have a good knowledge of high school algebra and geometry and some experience working with computers. Microsoft Excel will be used for some data analysis, but students will receive the necessary instruction in the use of this and other software.

Textbook: None required. Lecture notes and all other course materials will be provided via Blackboard.

Additional materials: You'll need something to write with and on, so make sure that you have pencils or pens, notebook or paper. You may want to have a calculator handy.

Policies:

Work Ethic: Distance education courses require more organization and self-discipline than traditional courses. You are responsible for keeping up with what is going on in the course, with any announcements and changes. Most importantly, you are responsible for keeping up with assignments. There is no time for makeups and there won't be any. Bottom line: you must do the learning - I can only assist and provide guidance and clarity.

Withdrawal: If you need to withdraw from this course you must do it within the University established time frame.

Students with disabilities: Please contact The Office of Disability Services (SUB I, Room 222, Phone 703-993-2474) if you have a learning or physical disability that will require accommodation in this class. You must obtain the proper paperwork as soon as possible and contact me during the first week of classes so that I can accommodate your needs throughout the course.

Student resources: for more info go to http://ctfe.gmu.edu/teaching/student-support-resources-on-campus/

Academic Advising Center – 703-993-2470
Office of Disability Services – 703-993-2474
Math Tutoring Center – 703-993-1460
Campus Counseling Center – 703-993-2380
Writing Center – 703-993-1200

Computer support: Computer and/or Web support is not my responsibility. You can find help as well as available workstations at the Johnson Center or contact GMU IT Support at support@gmu.edu.

Technology Requirements:

Nature of course delivery:

The course is delivered through Blackboard. Please be sure you have adequate technology to access the site and do the required work. Go to MyMason, sign in and select the Courses tab, then look for the Physics 103 001 course. If you need help, there is a section of the courses page of MyMason called "Courses 9.1 Resources for Faculty and Students" with helpful links. Other sources of help with Blackboard:

- Contact courses@gmu.edu and include your Mason email and G#
- Walk in and Phone support at the Collaborative Learning Hub, Johnson Center 311, (703) 993-3141
- Contact the ITU Support Center at (703) 993-8870 for general help, including login or network issues

Blackboard Login Instructions:

Access to My Mason and GMU email are required to participate successfully in this course. Please make sure to update your computer and prepare yourself to begin using the online format BEFORE the first day of class. Check the IT Support Center website. Navigate to the Student Support page for help and information about Blackboard. In the menu bar to the left you will find all the tools you need to become familiar with for this

course. Take time to learn each. Make sure you run a system check a few days before class. Become familiar with the attributes of Blackboard and online learning.

Hardware:

You will need access to a Windows or Macintosh computer with at least 2 GB of RAM and access to a fast and reliable broadband internet connection (e.g., cable, DSL). A larger screen is recommended for better visibility of course material. You will need speakers or headphones to hear recorded content and a headset with a microphone is recommended for the best experience. You will need a microphone and a webcam for tests as well as an old-fashioned calculator that is not connected to the internet. You must be able to download and install executable files, as well as to upload and download documents and spreadsheets, and may need to install programs or upgrades. A smartphone or iPad will not be sufficient for the course, be sure you have access to a fully featured computer. A computer with an operating system and web browser certified or at least compatible to support the new Blackboard 9.1:
http://www.edugarage.com/pages/viewpage.action?pageId=51414180

For the amount of Hard Disk Space required taking a distance education course, consider and allow for:

- the storage amount needed to install any additional software and
- space to store work that you will do for the course.

If you consider the purchase of a new computer, please go to Patriot Tech to see recommendations.

Software: This course uses Blackboard as the learning management system. You will need a browser and operating system that are listed compatible or certified with the Blackboard version available on the myMason Portal. See supported browsers and operating systems. Log in to myMason to access your registered courses.

You must have a GMU email account. I will not answer emails sent from a private email account. You will need to check email and Blackboard regularly and will be required to submit materials.

Online courses typically use Acrobat Reader, Flash, Java, and Windows Media Player, QuickTime and/or Real Media Player. Your computer should be capable of running current versions of those applications. Also, make sure your computer is protected from viruses by downloading the latest version of Symantec Endpoint Protection/Anti-Virus software for free here.

Students owning Macs or Linux should be aware that some courses may use software that only runs on Windows. You can set up a Mac computer with Boot Camp or virtualization software so Windows will also run on it. Watch this video about using Windows on a Mac. Computers running Linux can also be configured with virtualization software or configured to dual boot with Windows.

Note: If you are using an employer-provided computer or corporate office for class attendance, please verify with your systems administrators that you will be able to install the necessary applications and that system or corporate firewalls do not block access to any sites or media types.

Collaborate: Lectures, labs and office hours will be conducted using Collaborate Ultra, which you can access on Blackboard. To participate, you will need headphones and a mic. Instructions for using Collaborate are here:
https://its.gmu.edu/knowledge-base/introduction-to-blackboard-collaborate-ultra/

You can get a full student guide from the site linked above including the instructions for troubleshooting audio and connections. Office hours are not mandatory: your participation is welcomed, but not required. Office hours are for you: to ask me questions, get help, or discuss with me anything you want.

Course-specific Hardware/Software:

You will need to use MS Office in the lab portion of this class, specifically Excel, PowerPoint, and Word. Google Docs and Google Sheets are not sufficient, You can obtain and download Office 365 version. The on-line version is limited and lacks some capabilities needed for our labs. If you lack this software, do not despair lab work is done in groups, I hope that we'll have at least one member per group with the access to this software. We'll see when we meet for the first time how that shakes out.

For the tests, you'll need Respondus Lockdown Browser (can be downloaded from Blackboard) and a working microphone and a webcam. If you have privacy, technical, or other concerns related to using this system, please contact me to make alternative arrangements.

Hardware or software required for this course or program may be available for purchase at Patriot Computers (the University's computer store that offers educational discounts and special deals) or elsewhere.

Purpose: Physics 103 is part of the general education program at GMU: the Mason Core and fulfills Natural Science with Lab requirement. According to the GMU catalogue the purpose of general education courses is:

"…to educate, liberate, and broaden the mind, and to instill a lifelong love of learning. In conjunction with each student's major program of study and other electives, minors, or certificates, this program seeks to produce graduates with intellectual vision, creative abilities, and moral sensibility as well as skills to ensure a well-rounded and usable education.

General Education courses will ensure that all undergraduates develop skills in information gathering, written and oral communication, and analytical and quantitative reasoning; expose students to the development of knowledge by emphasizing major domains of thought and methods of inquiry; enable students to attain a breadth of knowledge that supports their specializations and contributes to their education in personal and professional ways; and encourage students to make important connections across boundaries—for example, among disciplines, between the university and the external world, and between the United States and other countries."

Overview:

Physics 103 is a general education natural science course, designed to help students understand the scientific process and to develop their scientific reasoning skills in the context of physics. Physics 103 has for its subject matter mechanics and thermodynamics. The class will focus on concepts, and the expression of these concepts in colloquial, mathematical, graphical, and schematic descriptions. You will be asked to show your understanding in all these ways on the exams. By the end of this term, you should have a strong conceptual understanding of the various primary topics, and be able to interpret data to support that understanding. An important learning goal is to help students understand and practice the rudiments of scientific reasoning as a model for investigations in other disciplines.

Learning outcomes:

1. Understand how scientific inquiry is based on investigation of evidence from the natural world, and that scientific knowledge and understanding:
    a) evolves based on new evidence
    b) differs from personal and cultural beliefs
2. Recognize the scope and limits of science.
3. Recognize and articulate the relationship between the natural sciences and society and the application of science to societal challenges (e.g., health, conservation, sustainability, energy, natural disasters, etc.).
4. Evaluate scientific information (e.g., distinguish primary and secondary sources, assess credibility and validity of information).
5. Apply knowledge of motion, forces, energy and momentum to explain natural physical processes and technological advances.
6. Use an understanding of mathematics along with physical principles to effectively solve problems encountered in everyday life and in the professional world.
7. Perform experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific results.
8. Assess the contributions of physics to our evolving understanding of our surroundings and the universe at large.

General course policies: In order to facilitate the optimum learning environment for your fellow students, the following behavior is expected:

- Class will start on time. Show up on time and be prepared to start working. If you experience technical difficulties, join when you can, but please refrain from disrupting the entire class with questions about what was already covered. I will record our sessions (hopefully I won't forget, but a reminder at the start of the session will be very welcomed) and make them available to you after class, so you can catch up on what you missed whether it's a part of the session or an entire class.
- This class requires active participation by you. You are expected to think, write, share, ask questions, and in general be engaged while you are here.
- Other than for a valid reason, please refrain from joining and leaving in the middle of the class: it is extremely distracting and discourteous to your fellow students as well as to me. This is a large class and we all need to be disciplined and work together to make it a success.
- Be respectful of yourself and others in the class. Try to find a quiet place or mute yourself. Don't talk When working in groups, keep voices to a low level so all can communicate; don't denigrate others' work or ideas. Give everyone in your group a chance to speak and contribute.
- Keep notes and keep them orderly so you can easily find things. Whether or not you choose to keep notes by hand or just listen is up to you, but you should bring some writing implements to practice solving problems in class.

Class components:

Pre-Lectures **Late assignments will not be accepted. There are no make-up pre-lecture quizzes.**

Lectures will be preceded by videos (most of them of my lectures delivered at GMU and televised by GMU TV, others I will pre-record for you). The videos will be followed by pre-lecture quizzes. These are the actual lectures that introduce important concepts and ideas. Watching these videos carefully and thoughtfully- they are vital. Take the time, make detailed notes, and prepare questions about aspects that you may find challenging. I will

expect you to be familiar with the content of the videos when we start the lecture meetings. **Treat these as the foundation for all of the course, the most important part of your learning.**

Lectures **Late assignments will not be accepted. There are no make-up worksheets.**

Lectures will be delivered synchronously on Collaborate Ultra. They will not be traditional lectures, but rather meetings where we clarify material introduced by pre-lecture videos and practice solving problems. The lecture will be inter-spread with in-class activities. Frequently worksheets will be provided for in-class work and you may be asked to submit them for grading. Attendance of these sessions is vital to your success, so show up and participate.

As the instructor in this course, I am the guide through the territory of physics. I will not be pouring facts into your head. **You must do the thinking and the learning: I can only assist and provide guidance and clarity.** Part of your task as a participant in this course is to help me identify the most difficult material, and to help interpret that material for your classmates. The lecture-videos, notes, and PowerPoint will not cover everything that I discuss in class. Likewise, I will not be talking about everything covered in the lecture-videos, notes, and PowerPoint, only the things I think are particularly important or confusing. **You need to watch the assigned videos, read the lecture notes and other reading materials, and go over PowerPoint lecture slides.** You are expected to spend at least thrice as much time studying as you spend in class, that is, if you study efficiently. If you don't, it can be a lot longer than that.

You are responsible for all the material covered in lecture and in the lecture notes as well as in any additional resources I may assign. There will be information about supplementary reading material, videos to watch, simulations to practice with. No make-up work will be given after the fact. If you must miss a class for some scheduled activity or because of health issues or other emergency, or if your technology fails, look for the recording of the missed Collaborate session and/or contact me or one of our Learning Assistants for help. Do not fall behind, and if you do, contact me as soon as it is feasible to get help catching up.

You are responsible for any announcements (including exam information and scheduling changes) made in class. Oral announcements made during class are binding and it is your responsibility to find out what has occurred in any class you might have missed.

Homework **Late assignments will not be accepted. There are no make-up homework.**

Homework is vital to reinforce the material you study, and to apply your new knowledge. Each week there will be a few assignments composed of questions and problems designated as pivotal to the current material. Majority of homework assignments will be posted on and delivered by Blackboard as a test. These assignments will not be timed and you will be allowed unlimited attempts until the due date. Correct answers will be available after the due date, so the assignments cannot be re-opened for credit, but I want to strongly encourage you to take time to study the answers, especially for those questions which you did not do well, so that you get a chance to learn from your mistakes and do better. Most of the questions on the tests will be similar to the homework questions.

Lab **Late reports will not be accepted. There are no make-up labs.**

The main purpose of the lab is to provide students with hands on experience in experimental physics. The "hands–on" part is not possible in the distance learning environment. Instead of working with actual laboratory equipment, we'll use computer simulations to investigate and test physics concepts, take measurements, collect and analyze the data and draw conclusions from it. See lab potion of the syllabus for schedule, policies, and

other information. Some lab sessions, at least in part, may be used to cover lecture material and to enhance your problem solving skills.

Exams **There are no make up exams.**

Exams will include problems, questions, interpretations of data and graphs similar to homework assignments and practice examples done in class, lab, and solved in lecture notes and handouts. Anything covered in class, lab, homework, the lecture notes, and assigned supplementary sources (including websites, applets, visualizations, and videos), may appear on the tests. In addition, tests may contain short essay questions in which you'll need to demonstrate your comprehension of the material.

Exam Schedule:

There will be three midterm tests and a comprehensive final. There are no make-up exams. If you do well on all three midterms, labs and homework, you don't need to take the final. The tests will be delivered via Blackboard using Respondus Lockdown Browser see Course-specific Hardware/Software section of Technical Requirements.

Test	Dates
Midterm 1	Wednesday, Sept. 22nd– Friday, Sept. 24th
Midterm 2	Wednesday, Oct. 27th – Friday, Oct. 30th
Midterm 3	Wednesday, Dec. 1st – Friday, Dec. 3rd
Final	Wednesday, Dec. 8th – Friday, Dec. 10th

Each test will be delivered for a period of a few days. If you miss a test, you get a zero. You can use a calculator (the old fashioned kind not connected to the web); the use cell phones and other devices with connectivity (other than your computer which will be locked out by Respondus) is not allowed. You can have a beverage, blank paper, writing implements, and paper notes. You will be prompted at the start to show the environment using the webcam. You will also be prompted for a photo ID. If you have privacy, technical, or other concerns related to using Respondus, please contact me well in advance of the test to make alternative arrangements. Limited number of students may be allowed to take the test in the COS testing Center. If you wish to go that route, please contact me first for permission: I need to make arrangements so that you can.

THERE WILL BE NO SO CALLED "EXTRA CREDIT PROJECT". That's a cop out and I'd rather you spend your time studying. So don't count on improving your grade that way. There are, however, going to be opportunities to earn extra credit points in the lab, in homework, and on the tests.

Honor code:

You are expected to adhere to the George Mason University student honor code:

"*George Mason University shares in the tradition of an honor system that has existed in Virginia since 1842. The Honor Code is an integral part of university life. On the application for admission, students sign a statement agreeing to conform to and uphold the Honor Code. Therefore, students are responsible for understanding the provisions of the code. In the spirit of the code, a student's word is a declaration of good faith acceptable as truth in all academic matters. Therefore, cheating and attempted cheating, plagiarism, lying, and stealing of academic work and related materials constitute Honor Code violations. To maintain an academic community according to these standards, students and faculty must report all alleged violations of the Honor Code to the Honor Committee. Any student who has knowledge of, but does not report, an Honor Code violation may be accused of lying under the Honor Code*."

We expect you to hold to this standard by carefully citing sources used in your work and by doing your own work on tests and individual assignments. In an environment where group work is highly valued it can be difficult to sort out what policies apply. At a minimum follow these guidelines:

- During all tests you must work alone and that includes online resources.
- Work identified as individual should be strictly your own. Submitting work of another student as your work is considered cheating.
- Students are expected to actively collaborate on assignments identified as group, e.g. in the lab, during a group quizzes, while practicing problem solving in lecture. I say collaborate, not mindlessly copy. All students working together are expected to do the work. In case of group assignments all group members assume responsibility for these assignments. Only students who actively participate are given credit.
- Students are also encouraged to form study groups to work on homework assignments and study the course material together. The group is responsible for ensuring that all members take part, learn the material, and understand how to do the assignments and not merely copy the other members' work.
- Material that is drawn from written or electronic sources must be appropriately cited. To cut and paste from web sources without citation is considered plagiarism,

If you have questions about the meaning of any of these terms or if you are in doubt about what the above policies mean in regard to specific assignments, ask me for a clarification. If you are caught cheating, you will be brought before the Academic Honor Council which may result in a failing grade in this course, a permanent mark on your transcript, suspension, or expulsion.

Grades:

Type of assignment	Percent
Homework, pre-lecture quizzes, activities, in-class participation, and discussions	35%
Labs	20%
Tests each	total 45% 15%

In this course, you will get exactly the grade you deserve by mathematically weighted average. It is **YOUR** responsibility, not mine, to make sure you study hard enough to get the grade you want. If you have any problems, contact me or one of our Learning Assistants **EARLY**. We will help you. I also recommend that you join a study group. If needed, get a tutor (free on-line tutoring approved by our Department is available, and I will provide you with the information on when and where as soon as I have it). Bottom line: do not wait until the last minute.

Your grade in this class will be based on homework, quizzes and other in-class work and participation, labs, 3 midterm exams (15 % each) and a final (redemption time).

I will **NOT** answer any questions about your individual grades at any time in class: you'll need to contact me by e-mail, visit my office hours, or make an appointment.

Final grades will be assigned by me at the end of the semester. Your final grade in this class will not be changed under any circumstances at any time.

NOTE: You must pass the lab to pass the course; if you get a failing grade in the lab, you will be given a failing grade in Physics 103.

Letter grade based on percentage score

Letter grade	Percent
A+	97-100
A	93-96.99
A-	90-92.99
B+	87-89.99
B	83-86.99
B-	80-82.99
C+	75-79.99
C	70-74.99
C-	67-69.99
D	60-66.99
F	below 60

How to study – a strategy for success:

As a college student you may think that this part of the syllabus is not needed. After all, you have successfully completed twelve grades of school and, unless you are a freshman, some other college classes.

Yet, the study practices you employed, while possibly adequate for many courses, may not be well tailored to the study of science. This class is cumulative, so in this class, as in any science class, full comprehension, and thus ability to master the new material, relies on your good grasp of the material previously covered, and, therefore, systematic study is vital. If a gap develops, it is hard, and soon impossible, to bridge it – it only grows wider and wider. It's sort of like trying to follow a plot in a mystery novel after skipping several chapters. So the first message is: don't let it happen, don't let the gaps develop and grow. Regularly scheduled assignments are designed to help you keep up, but, if for whatever reason, you are having hard time understanding the material and/or doing homework, you need to act right away to remedy this situation.

Below please find my suggestions for best study practices in order to succeed in this class:

- Watch pre-lecture videos and take pre-lecture quizzes. Bring the questions you may have to lecture.
- Attend the classes and participate. Pay attention and ask questions whenever anything is unclear.
- After each class read the pertinent lecture notes and review the slides (in slide show mode to get the full benefit of animations). Do not wait till the weekend, do it the day of the class when things are still fresh in your memory. Use supplementary resources referenced in the lecture notes and the slides. Visit recommended websites, watch visualizations and videos, work with simulations.
- If there are concepts that you feel are muddy and re-reading the relevant lecture notes and/or slides does not make them clear, get help from me, our Learning Assistants, and/or the tutor as soon as possible.
- Keep an updated equation sheet. This helps to summarize and distil the information and it is handy to have these equations readily available for future use on homework and tests.
- Complete the sample examples, questions, and problems in lecture notes, slides and/or supplementary handouts. Try solving them on your own without looking at the answer first.
- Do the assigned homework and make sure you understand the solutions. The most important way to learn physics is to practice solving problems. These homework assignments are there to help you. Use them. Before submitting answers, think if they make sense. It is critical that you complete and understand the assignments in order to do well on the tests. Moreover, homework is worth a large fraction of your final grade. If you think that you can do well in this class without doing homework, check your algebra!
- **MOST IMPORTANTLY**: **study systematically**; go over presented material after each class, lab, etc. Do not allow yourself to fall behind. In this class, one lecture builds upon another (or lab for that matter), so you will not be able to follow with comprehension if you skip something. This can very quickly result in a hole that grows so big it's impossible to climb out of it.
- If you have trouble following the material, do a reboot: go back to the last topic you feel comfortable with and start by re-reading it. Chances are the roots of your problem are somewhere there. If such additional review does not help, come see me our Learning Assistants, and/or a tutor.
- If you miss a class, study the covered material as soon as possible and come to see me, our Learning Assistants, and/or a tutor for further clarification.
- **Except for the work designated to be done individually, such as exams, work in groups.** It is always very productive to discuss things with your classmates and I encourage you to form study groups to work on practice problems, homework, and to quiz each other. I'll leave course room on Collaborate opened for you to use.
- Write down questions and ask away! It is vital to your learning.

Never hesitate to ask questions. *There are no dumb questions, only ignorance as a result of failure to seek an answer. Your suggestions for improving the course are also requested. You have a valuable perspective on the class, and I want to hear it and learn from it.*

Tentative Course Schedule for Physics 103 Fall 2021

(subject to verification by real life)

Week	Dates	Course Topic
1	Aug. 23 – Aug. 28	Introduction to Physics 103, science.
2	Aug. 30 – Sept 4	Motion: speed, velocity, acceleration.
3	Sept. 6 – 11	Freefall, vectors.
4	Sept. 13 – 18	Projectile motion, Newton's Laws, forces.
5	Sept. 20 – 25	Newton's Laws, forces continued.
6	Sept. 27 – Oct. 2	Newton's Laws, forces continued.
7	Oct. 4 – 9	Work, energy.
8	Oct. 11 – 16	Energy, momentum
9	Oct. 18 – 23	Momentum continued, circular motion
10	Oct. 25 – 30	Circular and rotational motion.
11	Nov. 1 – 6	Gravity.
12	Nov. 8 – 13	Gravity.
13	Nov. 15 – 20	Fluids.
14	Nov. 22 – 27	Fluids continued.
15	Nov. 29 – Dec. 4	Thermodynamics.

No class Monday Sept. 6th Labor Day, Monday Oct. 11th Fall break (Monday classes meet on Tuesday that week and Tuesday classes do not meet this week), and Thursday Nov. 25th Thanksgiving Recess.

Other important dates:

August 30th	*Last day to add classes*
September 7th	*Last day to drop classes without penalty*
September 14th	*Last day to drop (50% tuition penalty)*
September 28th – October 27th	*Selective withdrawal period*
December 4th	*Last day of classes*

See GMU Fall 2021 Academic Calendar for complete schedule at https://registrar.gmu.edu/calendars/fall_2021/

Labs:

Goals for the lab portion of the course:

1. To enhance lecture material covered in the main course by exposing students to actual application of the equations and phenomena discussed in lecture.
2. To help students understand the role that experiment plays in the scientific method.
3. To help students develop skills in quantitative and critical reasoning and the use of computer tools to interpret numeric data.
4. To help students develop technical writing skills.

Learning outcomes:

Participate in scientific inquiry and communicate the elements of the process, including:

a) Making careful and systematic observations
b) Developing and testing a hypothesis
c) Analyzing evidence
d) Interpreting results

General information:

- Since the class is online this fall, we'll not perform actual experiments as we normally would. Computer simulations will be used instead. Lab sessions will be performed synchronously using Blackboard Collaborate. Lab materials will be posted on Blackboard.

- I hope that the labs will be performed according to the lab schedule (at the end of this section), but please keep in mind that the class is being re-designed for distance learning so it is possible that at some point I may introduce some changes. In such case you will be notified by a mail and an announcement on Blackboard.

- In the beginning of each lab session I will quickly review problems encountered during the previous lab and some, hopefully few, misconceptions. I will then review concepts pertinent to the experiment we are about to do and show you how to work with the simulations to be used.

- The students then work in groups to perform the experiment, collect the data, do the required calculations, and compose and type the lab report.

- At any time, I and one of your Learning Assistants will be available to assist with any problems and answer any questions you may have. Please don't hesitate to ask for help or clarification otherwise you may run out of time to complete the experiment. Remember: discussions are encouraged in this class.

- Lab reports will be due on Wednesdays of the week the lab was performed. Late reports will not be accepted. If unforeseen circumstances require additional time to complete a particular report, I may allow you additional time, but you need to get my permission to submit late. You will upload the report and, when applicable, Excel worksheet into a dropbox on Blackboard.

- Some of the labs will be followed by post-lab quizzes. Post lab quizzes will be due on Wednesdays of the week the lab was performed.

Technical requirements: see lecture portion of the syllabus.

Grades

The laboratory grade counts 20% of the grade in PHYS 103, however **YOU ARE REQUIRED TO AT LEAST PASS THE LAB PORTION OF THE COURSE IN ORDER TO RECEIVE A PASSING GRADE IN THE ENTIRE COURSE.**

You should attend all lab sessions. There will be **NO MAKEUP SESSIONS. IF YOU MISS A LAB YOU GET A ZERO. IF YOU MISS 4 LABS OR MORE YOU AUTOMATICALLY FAIL!**

Your grade for each lab report will be based on the correctness of the data taking and interpretation of experimental results. The labs will be graded on a scale of 0-10 points.

Your final grade will be based on your average from the lab reports (80% of the score) and your average from lab quizzes (20% of the score). Depending on how things work out, I may adjust these percentages. I will drop one lowest lab score. Up to 5 % of the final lab grade may be awarded for participation, if merited.

I encourage you to work on your report throughout the class and make entries as you go, rather than wait till then end by which time you may have forgotten many important details. Save your work often: computers do fail on occasion. Once your report is completed and approved by all group members, submit it.

Tentative Lab Schedule for Physics 103, Fall 2021

(subject to verification by real life)

Week:	Dates:	Experiment:
1	Aug. 23rd, 24th, and 26th	Introduction to PHYS 103 lab 1
2	Aug. 30th, Aug. 31st, and Sept. 2nd	lab 1 A bit of trig
3	Sept. 6th, 7th, and 9th	No lab (Labor day)
4	Sept. 13th, 14th, and 16th	lab 2 Motion at constant velocity
5	Sept. 20th, 21st, and 23rd	lab 3 Motion at constant acceleration
6	Sept. 27th, 28th, and 30th	lab 4 Vectors
7	Oct. 4th, 5th, and 7th	lab 5 Projectile motion
8	Oct. 11th, 12th, and 14th	No lab (Fall break)
9	Oct. 18th, 19th, and 21st	lab 6 Forces part 1
10	Oct. 25th, 26th, and 28th	lab 7 Forces part 2
11	Nov. 1st, 2nd, and 4th	lab 8 Energy and momentum
12	Nov. 8th, 9th, and 11th	lab 9 Circular motion
13	Nov. 15th, 16th, and 18th	lab 10 Torque
14	Nov. 22nd, 23rd, and 25th	No lab (Thanksgiving)
15	Nov. 29th, 30th, and Dec. 2nd	lab 11 Gravitation and orbits