PH122 General Physics II Summer 2022

Instructor: Prof. Matthew Rhoades / SSC120 / 226-7813 / mwrhoade@bsc.edu

Class Info:

- Class: Monday, Tuesday, Thursday, & Friday 10:00–11:30 am / SSC 130
- Labs: Monday & Thursdays 1:00–4:00 pm / SSC 115

Office Hours:
I invite you to email me and utilize me as resource for any questions, concerns, or clarifications you may want.

- Monday, Tuesday, Thursday, & Friday - 9:00–10:00 am
- Monday, Tuesday, Thursday, & Friday - 11:30 am–1:00 pm

Your responsibilities: For your convenience, here's a quick summary of what I expect of you:

- Warm-up quizzes based on assigned readings - each evening before class meetings (Sunday, Monday, & Wednesday, Thursday)
- Class attendance and participation - every class meeting (Monday, Tuesday, Thursday, & Friday)
- Homework assignments - FOUR a week (Tuesday, Wednesday, & Friday, Saturday)
- Labs and tutorial - BI-weekly, in the section in which you are registered
- Problem-solving tutorial assignment - due Monday and Thursday evenings
- Exams - three during the semester, and a final exam
- Email - check it regularly
- Commitment - continual, replenished as soon as possible after challenging assignments

Overview: The first thing to do is visit the course page on Moodle immediately. You should already be enrolled, so just find the link to PH122. This complete syllabus can be found there (under "Course Information") along with a regularly updated schedule of reading and problem assignments. I encourage you to visit the web page often and make the most of what it has to offer. This course will be taught very differently from the way physics courses are typically taught elsewhere. I will not stand up at the front of the room and lecture at you. All of the material I could give you in this manner is already spelled out in your (excellent) textbook! Research has shown that active engagement in the classroom is crucial for deep understanding of the subject. A traditional lecture, in which students sit passively and take notes, is the worst way to ensure mastery of the material. However, there remains a common misconception among students that passive lecture is the only proper way to teach. If you agree with that sentiment now, you will not by the end of this course.

Instead of traditional lecture, I will devote class to discussing specific concepts and to testing and challenging your understanding with multiple-choice questions which will reveal misconceptions that are then discussed in a small group. For this to work; before each class, you must do all assigned reading while being an active reader, answers the Warm-ups, be an active participant in the class, and keep up with all homework assignments. General Physics requires a greater amount of

organization and a greater commitment on the student's part than most other one-unit courses. Plan accordingly.

Academic Accommodations: If you are registered for accommodations/ academic adjustments, please make an appointment with me as soon as possible to discuss accommodations/ academic adjustments that may be necessary. During this discussion, you are not expected to disclose any details concerning your disability, though you may discuss these details at your discretion. If you have a disability but have not contacted Angie Smith, the Coordinator for Academic Accessibility at BSC, please call 226-7909 or visit Student Development on the second floor of Norton Center to initiate the process. You may also contact her at awsmith@bsc.edu if you have any questions or need more information. Her office hours are Tuesdays, Wednesdays, and Thursdays 8:30-4:30 or Mondays and Fridays, by appointment.

Required Resources:

- All information about this course, including this syllabus, daily assignments, and warmup quizzes is available on Moodle. Check this site daily!
- The main textbook for this course is OpenStax University Physics (OS), which is freely available online. The OS website features a Student Resources section which includes a Student Solution Guide to homework questions and exercises in the book. This provides valuable help in the form of extra practice homework. (If you are the kind of person who likes to hold a book in your hands, you can follow a link to purchase a printed book.) I will post links to OS reading assignments on Moodle.
- MasteringPhysics (MP), the online homework system used for this course, is available with an access code you can access from within Moodle. Once you are registered for the course, you may access the MP course directly through Moodle or at this page.
- You must own a scientific calculator. This does not have to be an expensive graphing calculator, but it does need basic scientific functions like trigonometry and scientific notation. Bring this calculator to lab/tutorial and exams, and use it on homework. You must make sure you know how to use it! You may not use your phone as a calculator on exams, so don't get into the habit of using it on homework, either!
- (Optional) Through MasteringPhysics you have access to a second textbook, Sears and Zemansky's University Physics, (15^{th} ed), by Young and Freedman (Y&F). You may want to read both the OS and Y&F books to get different perspectives and see the slightly different notations used. Alternatively, you can choose to focus on one text or the other, whichever you prefer.

Reading and Warm-up Exercises: Before each class you should read the appropriate sections of the textbook as well as Dr. Rupright's and(or) Dr. Pontius' notes. You need to read the material actively, which means taking notes, writing questions that arise in your study, and working through (not just reading) the worked examples in the text. **Do not rely solely on the course notes for your reading preparation!** Dr. Rupright's and(or) Dr. Pontius' notes are short, incomplete snippets of information that focus mainly on hints for understanding the topics covered in the text. They are certainly no substitute for reading a book full of explanations, derivations, and worked examples that has

developed over several decades and multiple editions. ***Actively reading the textbook, i.e. writing your own notes or discovering questions, has shown to greatly improve the conceptual knowledge necessary to do well in this class.*** After reading the material, you will go to the course Moodle page and answer some warm-up questions based on that reading. Answer the warm-up questions on your own, with no discussion with your classmates and without looking back at the textbook or notes. This will give me the best sense of what you learned from the reading. My ability to identify, target, and correct any misconceptions is hindered if you approach the assignment in any other way. *With the exception of multiple-choice questions, credit on the warm-up assignment is given based on careful and thoughtful answers to questions,* ***not on the correctness of those answers.*** Try to understand what each question is asking and how it relates to the reading. Explain your reasoning.

In-class Activities:: The results of the warm-up exercises will help me determine how best to focus class time. Then class time will be short lectures on each topic within the lesson, followed by one or more multiple-choice conceptual questions, or "ConcepTests" (CTs), that highlight areas of difficulty and help reinforce your understanding. You will answer these CTs, individually in an attempt to identify your own misconceptions at first and then based on group discussions, using a clicker or an app which transmits your answer to the classroom computer.
Knowing what you don't know is more important than knowing you know, cause you already know you know.
The easiest way to do this is to install the **TurningPoint** app on your iOS or Android tablet or smartphone.

Homework: Homework assignments assure continued engagement with the subject outside of class, and give you the chance to test what you have learned by applying that knowledge to new challenges. When it comes to truly learning the subject and ensuring success in the course, there is absolutely no substitute for serious effort on homework assignments.

We will not spend class time working example problems. Therefore, as I noted above, it is imperative that you work through textbook examples in your reading. Consider these a first step in training you how to solve homework-style problems. Recommended practice problems from the OpenStax text, with answers provided in the Student Solution Guide, will offer you additional practice.

You will spend the first hour of each lab period working on one or more faculty-guided "tutorial" problems. This is where you will get a good interactive foundation in how to solve homework problems. These tutorial problems are graded not just for correctness, but also for completeness and adherence the problem-solving *process* that you will learn. The correct answer will usually come when you employ good problem-solving strategies. Ask me, your lab instructor, or your lab TA for help. Your grade on tutorial homework will factor into your lab grade, not your homework grade.

Your homework grade for this class will be based on 3-4 weekly problem sets. You will complete these exercises online using the **MasteringPhysics (MP) link on the Moodle class page**. You must purchase access either online or via the access card available at the BSC bookstore.

Each homework assignment will be available on MP before its due date. The 'A' weekly homework assignment, due before 11:59 pm, will contain carefully constructed problems that ask a series of multi-part questions designed to test your understanding and to give active feedback. Like the tutorial problems, you should view the 'A' assignments as training in problem-solving skills. **Begin working on these during the entire week that we are discussing the materials in class.**

The 'B' weekly homework set, due before 11:59 pm, will include traditional end-of-chapter textbook problems. The numerical data given in each problem will be randomized to ensure that each of you will have a unique numerical answer. These assignments are where we determine how well the training has paid off.

You will have six opportunities to submit your answers to each MP problem. Do not take these as six chances to enter random guesses in the hope that one of them is correct. Instead, think of this as six chances to test answers that you are very confident in, with the opportunity to check your work carefully if you are wrong.

I encourage you to work together on the homework assignments. Even if you think you understand the material well, you will learn even more by helping someone who is struggling on a particularly challenging problem. *(Remember, the best way to learn something is to teach it!)* However, each homework answer submitted to MP in your name must be your own work. Randomized numbers in problems should prevent straightforward copying from your friends. Allowing anyone else access to your MP account or to submit any answers in your name is an Honor Code violation. Use of anyone else's solution sets, either from previous PH122 students or from materials you may find online, is an Honor Code violation and I will respond appropriately! I have ways of determining whether you submitted your own work or solutions downloaded from the internet. I will send such Honor Code violations to the Honor Council.

A final note on homework. If you miss the homework deadline you will get rapidly diminishing credit for the next few hours, dropping to no credit thereafter. The good news is that MP will allow you to continue working homework solutions even long after this deadline. You should find time to work the homework correctly, as soon as possible, even after the credit deadline. Homework is necessary preparation for exams, so it's worth doing even for no credit! At the end of the term, I will allow you to bring up your grade on *one* homework assignment of your choice. If you took my advice and worked through the assignment even after missing the credit deadline, your answers will still be logged. At that point all I have to do is extend that assignment's deadline and you will immediately get credit for the answers you already submitted! If not, you'll have to spend time during final exam week working homework problems.

Labs: The laboratory is an important component of the course and you must be enrolled in a laboratory section to take this class (unless you are redeeming). No matter your grade on the rest of the assignments, you cannot pass the course if you do not pass the lab. Attendance in the lab is mandatory. Your laboratory instructor will go over the rules and policies for the lab.

Exams: We will have four exams in this course. All will involve conceptual discussion questions and homework-style problems involving mathematical manipulation. The first three unit exams will focus on the chapters and topics for that specific unit. However, because new concepts and skills in physics build on the older ones, you won't be able to answer questions and problems for chapters 8–10 if you cannot answer questions and problems from chapter 2. (Physics is cumulative!) The final exam will be truly comprehensive, with roughly equal emphasis on everything we have covered in the term.

The three unit exams will be given on **Friday, June 10; Friday, June 24; & Wednesday, July 13** You will need to find a free three-hour period between 8 am and 2 pm on each exam day to take the test. (This means that the last time you can pick up the test is 2 pm. If you pick it up later, you will not have a full three hours to do the test.) If you do not have a free three-hour block of time on exam day, you must see me as soon as possible to make other arrangements. The final exam will be given at **1-5 pm, Friday, July 15**. Everyone will take the exam at this time.

Each exam is closed-book and closed-notes. **You will only be allowed to use a single 8.5×11 inch sheet of paper, with whatever information you wish written on it** and a scientific calculator. Buy a scientific calculator and bring it with you to lab, recitation, and exams. You should not get into the habit of using your phone as a calculator because you will not be allowed to use it on the test!

I will provide you old exams from two previous years on the Moodle page to help you study for the exams. These practice exams may not be shared with others outside of the class, nor may they be archived for future students (such as in the files of a Greek organization). You are not allowed to study with any practice tests from any other prior physics classes taught at BSC.

Grading: Your course grade will be determined by a weighted average of all assignments as follows

Exam 1	15%
Exam 2	15%
Exam 3	15%
Exam 4 (Final)	15%
Lab & Tutorial	15%
Homework	15%
Warm-ups	5%
Class Participation	5%

Your participation grade will be based on the fraction of classes you actively engaged in *(attended, on-time, and participatory)*.

I will reward improvement on exams. If your final exam score is greater than the average of your unit exams, I will count the final exam as 30% of your course grade and each unit exam as 10%. As I said above, I will also allow you to bring up your homework grade by allowing you to complete or re-do one assignment of your choice.

Learning Outcomes: By the end of this course you will have demonstrated mastery of basic problems of thermal physics, electromagnetism, and optics by identifying the relevant physical principles for addressing any particular problem, developing effective strategies for solving the problem, formulating the problem as one or more equations and manipulating them into a form that can be evaluated with input data, applying and working with appropriate units for the physical quantities, and determining the reasonableness of your solutions by inspecting the physical context and using order-of-magnitude estimates of relevant quantities.

Overview: This is a second course in calculus-based physics for science and math majors. We will focus on thermal physics, electromagnetism, electric circuits, and geometric optics. You must have college credit for calculus-based General Physics I (PH 121 or equivalent).Physics is the fundamental science in two senses. First, the laws of physics underlie all other scientific laws. Physicists study systems ranging from the tiniest subatomic particles to the largest galaxies, and seek to explain the behaviors of both using a small set of fundamental theories. Second, because physics is a problem-solving discipline, a major focus of this course will be to learn how to extend what you learn to new problems. The problem-solving tools and reasoning skills you will learn in this class will help you as you study advanced courses in other disciplines.

Topics Covered:

Unit 1—Electricity
Electric forces, fields, and potentials, capacitors, resistors, circuits

Unit 2—Thermal Physics
Temperature, heat, thermal properties of matter, heat engines

Unit 3—Magnetism and Optics
Magnetic forces and fields, geometric optics

Honor Code: You are encouraged to cooperate and discuss homework problems and lab write-ups with your classmates. However, you may not turn in homework or lab write-ups that are not your own work. Once again, you may not use, or even look at homework solutions compiled by others. You may not use practice exams other than those I will provide you, nor may you archive them or otherwise share them with students in future physics classes. Exams are closed-book. You are allowed your one sheet of notebook paper as a reference. Using your tardy/absent friend's clicker to establish attendance is strictly forbidden. Be aware that I will bring any Honor Code violation I discover before the Honor Council. If you are found to be in violation for any part of an assignment, you will at minimum receive no credit for that assignment, in addition to any other action that may come from the Honor Council.

Title IX: Birmingham-Southern College is committed to the creation and maintenance of a safe learning environment for students and the campus community. The College forbids any type of sexual or gender-based misconduct among its students, faculty, and staff. The College encourages all members of the academic community to report suspected sexual and gender-based misconduct to

the appropriate authorities so that it can be investigated, remedied, and eliminated. Such misconduct is prohibited whether the actor is a student, faculty member, staff member, contractor, visitor, or another member of the College community. BSC forbids retaliation against any person who has opposed, reported or participated in an investigation concerning sexual or gender-based misconduct. In accordance with federal policy, all College employees are required to report information related to discrimination and harassment which includes, but is not limited to, sexual assault, relationship violence, stalking, and sexual harassment. For this reason, if you tell a faculty member about a situation of sexual harassment or sexual violence or other related misconduct, the faculty member must share that information with the Title IX coordinator. As a student, you can report allegations of sexual misconduct to officials in Student Development (Assistant Dean of Students, Dana Bekurs; Associate Dean of Students, W. David Miller; Vice President for Student Development, David Eberhardt), Campus Police, or confidential resources in Counseling Services, Health Services, and Religious Life. Please refer to the Title IX section of the BSC website for more information on filing a report and available resources.

PH 122 - Summer 2022 - Schedule

#	Day	Date	Class Topic	Reading Assignments	Exams, Labs, Tutorials
1	**Mon**	23-May	Electric & Gravitational Forces	Ch. 5.1-5.3 (v2) Ch. 13.1-13.2 (v1)	Tutorial Only
2	Tue	24-May	Electric & Gravitational Fields	Ch. 5.4-5.7 (v2)	
3	**Thu**	26-May	Potentials & Fields	Ch. 7.1-7.3 (v2) Ch. 13.3-13.4 (v1)	Potentials & Fields
4	Fri	27-May	Potential & Energy	Ch. 7.4-7.6 (v2)	
--	Mon	30-May	Memorial Day Holiday	No Class	
5	Tue	31-May	Capacitance	Ch. 8.1, 8.3 (v2)	
6	**Thu**	2-Jun	Capacitors	Ch. 8.2, 8.4–8.5 (v2)	Electric Power
7	Fri	3-Jun	Current & Resistance	Ch. 9 (v2)	
8	**Mon**	6-Jun	Resistors	Ch. 10.1–10.2 (v2)	Ohm's Law
9	Tue	7-Jun	Kirchoff's Rules	Ch. 10.3-10.4 (v2)	
10	**Thu**	9-Jun	Finishing Circuits	Review	Tutorial Only
--	**Fri**	**10-Jun**	**Exam 2**	***Friday (8 a.m. - 2 p.m.)***	**Chapters 5, 7–10 (v2)**
11	**Mon**	13-Jun	Temperature & Thermal Expansion	Ch. 1.1-1.3 (v2)	Thermal Equilibrium
12	Tue	14-Jun	Heat & Calorimetry	Ch. 1.4-1.6 (v2)	
13	**Thu**	16-Jun	Thermal Properties of Matter	Ch. 2 (v2)	Gases at constant T
14	Fri	17-Jun	Heat and work	Ch. 3.1-3.3 (v2)	
--	Mon	20-Jun	Juneteenth Holiday	No Class	
15	Tue	21-Jun	Thermodynamic processes	Ch. 3.4-3.6 (v2)	
16	**Thu**	23-Jun	Heat engines	Ch. 4.1-4.5 (v2)	Heat engines
--	**Fri**	**24-Jun**	**Exam 1**	***Friday (8 a.m. - 2 p.m.)***	**Chapters 1–4 (v2)**
17	**Mon**	27-Jun	Light, Images, & Reflection	Ch. 1.1–1.2, 2.1 (v3)	Radioactivity
18	Tue	28-Jun	Refraction	Ch. 1.3–1.4 (v3)	
19	**Thu**	30-Jun	Spherical Mirrors	Ch. 2.2–2.3 (v3)	Reflection & Refractio
20	Fri	1-Jul	Thin Lenses	Ch. 2.4-2.7 (v3)	
--	Mon	4-Jul	July 4th Holiday	No Class	
21	Tue	5-Jul	Introduction to Magnetism	Ch. 11.1–11.3 (v2)	
22	**Thu**	7-Jul	Magnetic Forces	Ch. 11.4–11.7 (v2)	Thin Lenses
23	Fri	8-Jul	Magnetic Sources	Ch 12.1-12.4 (v2)	
24	**Mon**	11-Jul	Gauss's Law	Ch. 6.1-6.4 (v2)	Tutorial Only
25	Tue	12-Jul	Finish Unit 3	Review	
--	**Wed**	**13-Jul**	**Exam 3**	***Wednesday (8 a.m. - 2 p.m.)***	**Chapters 1–2 (v3)** **Chapters 6,11-12 (v2)**
--	Thu	14-Jul	Reading Day	No Class	
--	**Fri**	**15-Jul**	**FINAL Exam**	***Friday (1 - 5 p.m.)***	