

# General Physics I

PHY 161.001/002 --- Spring 2016 Syllabus

Physics Department --- Mercer University

**Text (eBook):** Fundamentals of Physics, 9<sup>th</sup> edition, by Halliday, Resnick and Walker

**Class Lecture Meetings:** MWF 12-12:50am in SEB 110

**Lab Meetings in SEB 219:** 161.001/T 9:25am-12:05, 161.002/R 12:15pm-2:55

**Instructor (including labs):** Dr. Jose L. Balduz Jr.

**email:** [balduz\\_jl@mercer.edu](mailto:balduz_jl@mercer.edu), **office:** SEB 205, **phone:** 478-301-2229

**office hours:** MW 4:30-5:30pm, T 2-3pm, R 3-4pm, or by appointment (try email)...

**Course web page:** <http://physics.mercer.edu/Balduz/GenPhys/phy161home.htm>

Please also see Physics Department home page at <http://physics.mercer.edu>.

This course is the first in the two-semester sequence **PHY 161/162 General Physics I/II**, a calculus-based introduction to physics. The main theme in this course is that of mechanics of point particles and extended objects. The course contains both lecture and lab components that will help students learn to think scientifically about the physical world. Following a brief introduction we will consider a series of major topics: **Kinematics, Vectors, Newton's Laws of Motion, Energy, Momentum, Rotation and Oscillations**. This course is intended primarily for physics, chemistry, math, and engineering majors, but is also recommended for others with good mathematical aptitude, including pre-med students and life sciences majors. Students must already have a working knowledge of geometry, algebra and trigonometry. The course **MAT 191 Calculus I** is co-requisite: Students must be concurrently enrolled or have equivalent prior academic credit.

Nature behaves in predictable ways which scientists, over hundreds of years, have formulated into a set of basic physical laws. In the lecture portion of this course, students will learn some of these laws and use them to analyze systems mathematically, reach qualitative conclusions, and compute accurately numerical answers to specific questions. Although we will cover a number of topics and physical systems, the students' goal should be to learn to think about nature broadly, and solve problems by specific application of general principles, as physicists do.

The ultimate validity of these natural laws always rests on experimental evidence. In the lab portion of this course we will illustrate, by experiment, a portion of those laws describing the behavior of simple mechanical systems. In the process, students will gain basic concepts and procedures of physics laboratory work. They will become familiar with simple experimental apparatus; measure quantities such as displacement, time, velocity and acceleration; compute derived quantities from the data, and perform basic statistical analysis of the data and the derived quantities; and reason from this analysis to answer questions and arrive at logically sound conclusions about the physical world. This process will help them to master the concepts introduced in the lectures, by showing them in action in the laboratory setting. Although we will investigate a number of specific physical systems, students' goal should be to learn to think about nature and perform experiments as physicists do.

The following **Student Learning Outcomes** are common to all courses in the Natural World (NAT) block of the Foundational Studies requirement in the College of Liberal Arts. Students will be able to analyze the natural world as exhibited by the ability to

1. Generate a hypothesis to explain natural phenomena;
2. Collect and organize experimental data in a format appropriate to a scientific field;
3. Analyze data through the use of quantitative and/or qualitative scientific reasoning;
4. Interpret a hypothesis in light of experimental evidence;
5. Accurately communicate scientific knowledge, observations, analyses, and/or conclusions.

In addition, students will improve their abilities in the following general areas during successful completion of this course:

- **Conceptual understanding:** Ability to describe and explain the physics concepts relevant to physical systems of interest.
- **Problem solving:** Ability to analyze a complex problem by setting up the mathematical description of the relevant physical system, and planning and carrying out the calculation of numerical predictions for measurable properties of the system, using basic logic and critical thinking, as well as basic mathematical tools (algebra, trigonometry, calculus).
- **Practical laboratory skills:** Experience working in groups on a laboratory experiment, setting up laboratory equipment safely and efficiently, collaborating on lab reports. Ability to creatively plan and carry out experimental procedures; to collect, analyze and interpret experimental data; to identify possible sources of error and implement techniques that enhance precision; to report the experimental data, results, and assessment of reliability in clear and concise manner.

## COURSE MECHANICS

**WebAssign and the eBook:** Each student in the course must obtain an online account with WebAssign that will cost \$45.95 and will provide access to the online homework assignments and other problems. For an additional optional \$44.75 (total \$90.70), the account will also have access to the HRW9 eBook. Relevant links will be provided on the course webpage. A regular hardcover textbook is also available at the campus bookstore and elsewhere.

**Course web page:** During lecture class meetings the instructor will use both a projector and the whiteboard. Most material presented on the projector in class will be available on the course homepage: basic conceptual material, examples and solutions to textbook problems. Quiz and exam solutions will also be posted after these are graded. In addition, other materials which cannot be presented in class due to time constraints will also be posted on the web page: additional textbook problems, old quizzes and exams, and additional practice exam problems. Former students have said that the course web page was very helpful to them, so every student should make good use of this resource.

**Lecture sessions:** During scheduled "lecture" class periods we will have reading quizzes, lectures on the reading assignments, group work and exams. During lectures, the instructor will give a conceptual and theoretical overview of the course material, present examples, go over solutions to textbook problems, answer questions and ask questions to stimulate thinking and discussion. We will often access and use an online version of the text.

**Office hours:** Please come see me! If you're doing well in the course, we can talk about physics concepts and the big picture; or about your life after Mercer; or other things... If you're not doing so well in this class, I can try to help you one-on-one, before you get too far behind. Typically that means talking about the material with you, but also having you work problems with me right in my office. There's no substitute for working through a problem yourself, with someone by your side that knows the way...

**Lab sessions:** Each student will be a member of a lab group. Students may form groups as they wish for each lab exercise. All data collection will be performed by the group. After that, each group must work to complete all data analysis, i.e. data tables and required graphs, before leaving the lab. Often, students will have enough time to complete the entire lab procedure and the analysis during one session. Other times, there will not be enough time during the session, and it will be necessary to finish the analysis later. During each lab session, each student is obligated to a) attend the entire session, b) work successfully with the group to collect the data, and c) help the group carry out the required analysis during the session. Typically, students will not be able to leave the lab session early: Any student who arrives late, fails to contribute to the group work, acts in a disruptive manner, or leaves early without instructor permission will suffer a penalty to their grade for that lab.

**Assessment tests:** Each student is required to participate in testing for assessment purposes, which may lead to a course grade bonus. At the beginning of the course, students will be asked to individually complete a conceptual test on electricity and magnetism, the **pre-test**. The pre-test score itself will not form part of any student's grade. At the end of the course, students will be asked to individually complete another conceptual test, the **post-test**. The overall pre-test and post-test results will be used by the physics department in the assessment of our program success. If a student completes both tests, the post-test result will be used to grant them a bonus on their course grade of up to +1%: a score of 50% or better will yield +0.25% bonus, 60% or better will yield +0.50% bonus, 70% or better will yield +0.75% bonus, and 80% or better will yield +1.00% (Bonuses are non-cumulative.). **Note:** In order to receive any course grade bonus, a student must take both the pre-test and the post-test, unless that student was excused from the pre-test: For each test, they must complete it to the best of their ability, and completely and accurately enter their name, student ID and other information on the answer sheet.

**Reading assignments / Reading quizzes (8% of total grade):** Before discussing a topic in class, it is vital that each student be at least somewhat familiar with the content. To this end, students will receive a series of reading assignments, to be completed before a specific day of class. Before we begin to cover the relevant material in class, we will have an individual reading quiz. This will be brief, and will consist of a few conceptual questions, with no numerical calculations. The reading quizzes will be *closed-book*: i.e., students are not allowed use of a textbook, notes or devices.

**Classwork (15% of total grade):** After a topic has been introduced via the reading assignment, reading quiz, and lecture, students will be given a set of problems to solve together in groups. Students may form these groups as they wish, and they may vary from day to day; however, the instructor reserves the right to change or pick the groups if he deems it appropriate. Classwork will be *open-book*. Any work that is not successfully completed in class may be taken home, completed, and turned into the instructor at the start of the following lecture session.

**Homework (one per chapter, for 12% of total grade):** Each student will use WebAssign to complete a homework assignment for each chapter. Students may work individually or in groups, and they may use the textbook or any other resources except for the Instructor's Solutions Manual, which is considered off-limits. Although you are encouraged to work together, each student must submit their own answers, by the due date, electronically in their own account to receive credit.

**Lab work (15% of total grade):**

**Lab reports:** For most labs, students must submit reports containing data tables, graphs, conclusions, and answers to additional questions: For details please see "*Lab Report Guidelines*." In most cases, reports will be prepared after the lab session and will be due on the day of the next lab session. The students in each group must either submit individual reports or a group report as they wish. For any report, each student who helped to prepare it must sign it, and everybody who signs it will receive the same grade. Depending on the amount of work involved, each report will be worth a variable number of points ranging from 50 to 100. In cases where all report elements are required, the number of points will be close to 100: data tables and graphs will account for about 20% of the grade, with the introduction, answers to questions and conclusions accounting for the remaining 80%. In cases where there are no questions to be answered and/or no formal conclusions to be drawn, the number of points will be reduced. In some cases students will hand in their work at the end of the lab session; these short reports will also be worth close to 50 points.

**Pre-exam practice problem sessions:** During the lab session before each exam (A, B, C and D), students will do classwork in groups, instead of a lab exercise. This will consist of textbook problems, and is intended to help prepare them for the upcoming exam, especially as it reveals areas that still need work. These will be *open-book* sessions, so notes, textbooks, and mobile devices will be allowed.

**Exams (four, for 30% of the total grade):** The four exams (A, B, C and D) will consist entirely of numerical problems. The exams will be *closed-book* tests: no notes, textbooks, or mobile devices will be allowed, but the instructor will supply a formula sheet. The topics and *tentative* dates for the exams are as follows:

- Exam A (TBA): 1-D Kinematics and Vectors [Ch. 1-3],
- Exam B (TBA): 2-D Kinematics and Newton's Laws [Ch. 4-5],
- Exam C (TBA): Newton's Laws and Energy [Ch. 6-7],
- Exam D (TBA): Conservation of Energy and Momentum [Ch. 8-9].

Note: Only the best three scores from the four exams (A, B, C and D) will be counted.

**Final exam (20% of the total grade): Monday, May 2, 2-5pm**

The final exam will be comprehensive, including all the material covered in the course. It will consist of two parts. The first part will contain numerical problems. The second part will contain both qualitative and quantitative multiple choice questions. The final exam will also be a *closed-book* test.

**GRADING SCALE:** How much weight is given to each activity, in percentages of the total grade, is shown in the left table below. The final letter grade will be determined from the total grade using the scale shown in the right table below.

|                              | #   | % each | total %    |           | GP  | %       |
|------------------------------|-----|--------|------------|-----------|-----|---------|
| <b>Reading quizzes</b>       | ~10 | ~1     | 8          | <b>A</b>  | 4.0 | 90-100+ |
| <b>Classwork</b>             | var | var    | 15         | <b>B+</b> | 3.5 | 85-89   |
| <b>Homework</b>              | ~10 | ~1     | 12         | <b>B</b>  | 3.0 | 80-84   |
| <b>Lab work</b>              | ~15 | ~1     | 15         | <b>C+</b> | 2.5 | 75-79   |
| <b>Exams (A, B, C and D)</b> | 3   | 10     | 30         | <b>C</b>  | 2.0 | 70-74   |
| <b>Final exam</b>            | 1   | 20     | 20         | <b>D</b>  | 1.0 | 60-69   |
| <b>Total</b>                 |     |        | <b>100</b> | <b>F</b>  | 0.0 | 0-59    |

**ADDITIONAL NOTES**

**Syllabus changes:** The dates for exams A, B, C and D are tentative and subject to revision. If other changes to this syllabus are necessary, they will be implemented after discussion and negotiation with the students.

**Missed labs, quizzes and exams:** To avoid hurting their grade, when a student misses any in-class activity (quizzes, classwork, exams, labs) they must convince the instructor that their absence was unavoidable or served a very good cause (e.g. when a student represents Mercer as part of a team). If their absence is not excused they will receive no credit for that activity. It is best to speak to the instructor ahead of time, or to present an official excuse from a Dean or team faculty advisor, or a doctor's excuse.

- There are no make-ups. If a class absence is excused by the instructor, the student's grade will be pro-rated for the activities on that day - i.e. their final grade will not suffer. Anybody who did not take part in a lab session should not sign a report for that lab: They cannot receive any credit for that lab.
- Missed exams which are excused by the instructor may be made up. However, if no alternate arrangements were made *beforehand*, this will be allowed only if the student has an official excuse: e.g., a note from a Dean's office, or a detailed doctor's note.

**Lab safety:** Lab equipment may be hazardous to your health. Always follow the instructions of your lab instructor or their lab assistant, and consider the well-being of your classmates as well as yourself... Think Safety First!

**Lab manuals:** The lab manuals (instruction sets and data tables) are viewable on computers in SEB 219 during lab sessions, and copies of relevant instructions will be handed out to each lab group. Students may print completed data tables, graphs and lab reports during the lab sessions; please do not print additional copies of the lab instructions.

**Dropped grades:** There will be no dropped grades. All work done in the course will be counted.  
Exception: Only the best three scores from the four exams (A, B, C and D) will be counted.

**Extra credit:** There will be no extra-credit work, except what is associated with the assessment post-test.

**Honor Code:** The College of Liberal Arts' academic misconduct policy will be followed. All students are bound by the Mercer University Honor Code... In addition, for all graded work completed in this class (except the online homework), each student must write their name on the paper, and they must sign the paper themselves; otherwise they will receive no credit. It is unethical, and a violation of the honor code of this university, for any student to submit work in person or online for credit, knowing that some person who may get credit did not contribute significantly to that piece of work. This applies not only to homework sets but also to quizzes, classwork, exams, term papers, lab reports and any other work you do at this or any other school...

**Electronic devices:** In order to maximize student engagement and to minimize sources of distraction, no remote devices (laptop computers, tablets, cell phones...) may be used when class is in session. Likewise, no student should communicate electronically with any person inside or outside the classroom by any means while class is in session. During quizzes and exams, no electronic devices of any kind may be used except for a calculator. Exceptions: (a) In lecture sessions, students may use remotes to access the course web page and the eBook while doing classwork. (b) In pre-exam practice sessions, students may freely use remotes, except to find online solutions to practice problems(!). (c) In lecture sessions, *laptop or tablet use may be allowed*, for note-taking and access to the course web page and the eBook, if this is not disruptive to other students, and if the laptop user pays attention to and remains engaged in the class; If this is not the case, or if any other use of the device is made, the instructor will ask the student to close the device, on a permanent basis. Nevertheless, it is strongly advised, that students take notes by hand and bring a paper textbook to class. Any violation of these rules may result in the offending student being asked to leave the classroom.

**Disability support:** Students requiring accommodations for a disability should inform the instructor at the close of the first class meeting or as soon as possible. The instructor will refer you to the Disability Support Services Coordinator to document your disability, determine eligibility for accommodations under the ADA/Section 504 and to request a Faculty Accommodation Form. Disability accommodations or status will not be indicated on academic transcripts. In order to receive accommodations in a class, students with sensory, learning, psychological, physical or medical disabilities must provide their instructor with a Faculty Accommodation Form to sign. Students must return the signed form to the Disability Services Coordinator. A new form must be requested each semester. Students with a history of a disability, perceived as having a disability, or with a current disability, who do not wish to use academic accommodations are also strongly encouraged to register with the Disability Services Coordinator and request a Faculty Accommodation Form each semester. For further information, please contact Carole Burrowbridge, Disability Services Coordinator, at 301-2778 or visit the Disability Support Services website at <http://www.mercer.edu/studentaffairs/disabilityservices>

All requests for reasonable accommodation are welcome also in regard to absence from class for school representation (i.e., athletic or other events) or personal/family problems.