PHYSICS 1102W.100 Syllabus
Introductory College Physics II, Spring 2019

Instructor: Prof. Michael Zudov
Email: zudov001@umn.edu (please always include “1102” in the subject line)
Office Hours: I am generally available for a meeting on any lecture day. To schedule time please e-mail the day before or see me before/after lecture.
Lectures: M, W, F 1:25 – 2:15 PM in Tate B20

Welcome to 1102W! This is the second term of a course sequence designed to prepare you for work in your field by: having solid conceptual understanding of the way the real world works based on a few fundamental principles of physics; being able to solve realistic problems using logical reasoning and quantitative problem solving skills; applying those physics concepts and problem solving skills to new situations; and learning to effectively communicate technical information. To achieve these goals, this course requires an in-depth understanding of the material. This course will emphasize the application of the principles and skills learned in Physics 1101W to more complex, abstract, and realistic situations involving topics from fluids, waves, electricity, magnetism, optics, and atomic physics. A laboratory requires you to apply both the concepts and problem solving skills taught in this course to the real world. It will also emphasize technical communications skills. A discussion section gives you the opportunity to discuss your conceptual understanding and your problem solving skills by practicing working problems with other students. The laboratory and discussions sections emphasize collaborative problem solving as a powerful learning tool and as a preparation for work in your profession.

Warning: The pace of the 1102 course is significantly faster than 1101. We will not have time to develop all the concepts in lecture that are described in the book and that you will need to know for exams. You might also find that you may need to work with a concept in laboratory or discussion before it is developed in lecture. For these reasons it is important for you do the assigned reading and homework problems.

SUMMARY
Before each lecture:
- Read the assigned readings.
- Work through textbook examples and read the homework assignment.
Before each lab:
- Read the lab manual for the problems your instructor has assigned for that week.
- Complete the Warm-Up Questions and turn them in to your TA.
- Complete any suggested text reading given in the Preparation and Warm-up sections.
On-going:
- Complete the assigned homework problems (and self-grade; you don’t have to turn them in).
- If you have questions on homework problems, etc., please attend TA tutoring hours.
- Lab reports will be due approximately every two weeks. Your TA will assign them.
Quizzes and final exam:
- There will be 4 quizzes given during lecture times.
- There will be a group problem as part of each quiz which will be given in discussion section.
- The final exam is on Saturday, May 11, 8:00 – 11:00 AM
Class Webpage URL: https://www.physics.umn.edu/, select Courses, select Phys 1102W.100. You must log in using your University X.500 username and password.

Course materials
1. Textbook (required): *College Physics: A Strategic Approach* by Knight, 3rd edition (2015). The bookstore has a special U of M edition (2016) – the regular College Physics text has 30 chapters. The custom volume 1 contains chapters 1-10 (Phys 1101). **The custom volume 2 contains chapters 11-30 (Phys 1102).** If you already own the custom Volume 1, you might find it useful to keep until you have competed 1102. We will be referring back to material that you learned in 1101.
2. Lab Manual (required) will be available in .pdf format from on the class website
3. Lab Journal (required): Univ. of Minnesota 2077-S
4. iClicker 2 (required): available at the Bookstore.
5. A bound notebook for all the homework problems. You must bring it with you to office hours and to the TA help room.
6. Calculator: Ti-30xa or other simple scientific calculator. (optional)
7. The Competent Problem Solver for Introductory Physics, by Heller and Heller. (optional)

TA office hours: Office hours held by the 1102 TAs will be posted on the class website. Keep in mind that all TAs in the tutoring room are available for consultation on all introductory courses. Feel free to consult any physics TA holding office hours in that room.

Prerequisites: Physics 1102 requires that you have successfully completed Phys 1101. The math skills required are the same as for 1101, you will need a solid working knowledge of algebra and trigonometry. Appendix A in your text provides an overview of the tools you will need. If you did not take Physics 1101 and have satisfied your prerequisite in some other way, you should meet with your TA to discuss any concerns.

Work load: This is a demanding course. There is a lot to learn. The course moves at a fast pace with more diversity in content than Phys 1101. You should expect and plan for a workload consistent with University policy (three hours per week per credit for a total of twelve hours per week for an average student to receive an average grade).

Lectures: In lecture we will motivate and introduce new material, analyze some example problems, and generally work to organize and interpret the knowledge accumulated in your reading, in lab, and in other course activities. Our task will be to elaborate on important and difficult ideas, and to clarify points that may be confusing. We will utilize a variety of tools and devices to assist in clarifying concepts and methods. Where appropriate, lecture demonstrations will be used to illustrate new concepts, and we will attempt to recognize and address misconceptions that arise. In-class questions (ICQ) will be posed for class response using the iClicker 2. We will develop strategies for solving problems that will be applied and reinforced in discussion sessions and labs. ICQs and other problem solving will be often done in groups. It is impossible to cover all of the details in lecture and *it is not our intention to duplicate the text.* You should complete assigned reading before attending class. By preparing in advance and asking informed questions you can help ensure that class time is used to maximum advantage.
Throughout the course, we will learn strategies for solving physics problems. We will do examples with these strategies, and you will be required to apply them explicitly in solving homework, discussion session and test problems.

Classroom courtesy: Lectures end when the idea or technique under discussion has been concluded and the lecturer has indicated that the students are free to leave. For this reason lectures are rarely expected to end exactly at the end of class time. Packing up books, putting on coats, or standing up while the lecture is in progress interferes with the learning of other students and shows disrespect for the educational process. Those who must leave early should sit near the end of a row to minimize the disturbance they will inflict on the other students. During lectures no talking, no open laptops/ipads (not even for taking notes), no earphones, no cell phones, no food/drink, no newspapers/crosswords are allowed. You may be asked to leave the classroom if the instructor considers that your behavior is interfering with the learning process of the other students.

Tentative class schedule (subject to change):

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<thead>
<tr>
<th>week</th>
<th>of</th>
<th>topic</th>
<th>chapter</th>
<th>laboratory</th>
<th>notes</th>
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<tbody>
<tr>
<td>1</td>
<td>01.21</td>
<td>Oscillations</td>
<td>4</td>
<td>Diagnostic tests</td>
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<tr>
<td>2</td>
<td>01.28</td>
<td>Waves</td>
<td>5</td>
<td>Lab II: 3-5 oscillations</td>
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<tr>
<td>3</td>
<td>02.04</td>
<td>Superposition</td>
<td>6</td>
<td>Lab III: 1-2 waves</td>
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<tr>
<td>4</td>
<td>02.11</td>
<td>Electric fields &amp; forces</td>
<td>10</td>
<td>Lab III: 3-4 waves</td>
<td>Quiz 1</td>
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<td>5</td>
<td>02.18</td>
<td>Electric potential</td>
<td>11</td>
<td>Lab IV: 1-3 E-field</td>
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<tr>
<td>6</td>
<td>02.25</td>
<td>Current and resistance</td>
<td>12</td>
<td>Lab IV: 5,6 E-field</td>
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<tr>
<td>7</td>
<td>03.04</td>
<td>Circuits</td>
<td>13</td>
<td>Lab V: 1-3 current, resistance</td>
<td>Quiz 2</td>
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<td>8</td>
<td>03.11</td>
<td>Magnetic fields &amp; forces</td>
<td>14</td>
<td>Lab V: 4,5 circuits</td>
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<td>9</td>
<td>03.18</td>
<td>Spring break</td>
<td>15</td>
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<td>10</td>
<td>03.25</td>
<td>Induction</td>
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<td>Lab VI: 3,4 B-field</td>
<td>Quiz 3</td>
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<td>EM waves</td>
<td>15</td>
<td>Lab VI: 5 + generator</td>
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<td>Wave optics</td>
<td>7</td>
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<tr>
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<td>04.15</td>
<td>Ray optics</td>
<td>8</td>
<td>Ray Optics</td>
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<tr>
<td>14</td>
<td>04.22</td>
<td>Relativity (Kinematics)</td>
<td>27</td>
<td>Ray Optics</td>
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<tr>
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<td>04.29</td>
<td>Relativity (Dynamics)</td>
<td>27</td>
<td>TBA</td>
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<tr>
<td>16</td>
<td>05.06</td>
<td>TBA</td>
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Reading and Problem Assignments: Your primary learning tool in this course is the working on physics problems from the textbook and provided by us. These include homework problems and in-class problems. It is important to solve physics problems, whether they are simple exercises or context rich problems, as best as you can before examining the solution provided by an “expert.” As the first step in this, it may be most beneficial to your reading if you treat the examples given in the text as problems, solving them yourself before you read the authors’ solutions. You do not fully understand how to solve a problem, and the underlying physical principles or their application to the problem, until you can find the solution without looking at someone else’s solution. Working problems is the only reliable way to test your understanding of a topic. Try as many of the problems as you have time for. If your answer agrees with the solution manual, great! If not, or if you can’t come up with any answer, seek help from the 1102 instructional team, including the TAs in the Physics Tutoring Room. Some of your fellow
students are also potentially good resources. Doing physics problems is hard work, but you will be rewarded by a deeper understanding and sense of accomplishment. The test problems will be of the same type and general level of difficulty as the problems that you will be assigned, or presented in lecture, or worked on by your group in your discussion section.

As mentioned above, we will develop strategies for solving problems. In practice, we will adhere to the strategies articulated in the required text. However, you may choose to supplement your problem-solving strategies by reading “The Competent Problem Solver”. The University of Minnesota Physics Education Research Group has long been at the forefront of the study of how skilled problem solvers actually solve problems, particularly those that are more complex than the simpler exercises and examples, and more like real world situations. Much of this is detailed in “The Competent Problem Solver” which is optional for this course. In order to illustrate a common strategy of expert problem solvers, the book first applies it to simple problems, so simple that most of you could solve them much faster than an application of this method. While the discipline of using this method on simple problems may at first seem frustrating, it generally pays off when the problems become more difficult.

**Homework:** Homework assignments for each book chapter will be posted on the class website. While homework will not be graded, it forms the core of your learning experience and you are urged to do as many problems as you can. As there are no grades given for homework, the due dates given for an assignment are for guidance only and are typically the day before a quiz on the material in the homework.

**In class questions (ICQ):** Ordinarily during class there will be several In-class questions (ICQ), which will be graded for class participation points (5% of your total grade). For graded ICQ questions, we will use the iClicker 2, the personal response system now used by the Chemistry, Biology, and Physics departments. Using other students’ clickers constitutes academic cheating.

**Discussion Sessions:** In discussion sessions you work with classmates to solve a challenging problem in small groups. Some analysis of the solution will be presented at the end of the session and/or the solutions will be posted on the class website. On quiz week, there will be a group problem in the discussion section, which will count for 25% of the total quiz grade. Your group will solve that problem collaboratively with all group members receiving the same score for that problem. Only those participating in all discussion sessions during the preceding weeks will be allowed to take the group part of the quiz (except if you have a University approved excused absence – you must inform your TA as soon as possible that you will be absent for any discussions). For every discussion session missed, 50% of the group quiz score that follows the absenteeism will be subtracted. If you are more than 10 minutes late to the group quiz, you will have to take the quiz on your own. The TA will assign the groups and new groups will be assigned after each quiz.

**Laboratories:** Labs are usually coordinated with lectures, however you may be asked to do a lab BEFORE concepts are introduced in lecture. To get the most out of lab, you will need to keep up on your assigned reading. The labs are designed to give you an opportunity to test, expand and refine your understanding of basic physics concepts. Careful recording of observations in your lab journal and preparation of formal lab reports are important parts of this experience. Since you carry out the lab exercises in a group and the equipment for each lab is available for only a
limited time, make-ups are not possible. You will need to consult as soon as possible with your lab instructor (TA) if an officially excused absence from lab proves unavoidable. For every lab missed 50% of the next assigned lab report will be taken off.

Because this course satisfies University requirements as a laboratory science class and as a writing intensive course, you must receive **a minimum laboratory grade of 60%** to receive a passing grade in the course. The laboratory grade will be based on the demonstration of a well-organized and correct written technical communication of the physics concepts of this course in your laboratory journal and laboratory reports, well thought out predictions and answers to the questions in the laboratory manual brought to class, and collaborative skills as evidenced by effective group work. Failure to participate in the laboratory will result in a laboratory grade of 0 for that topic. No laboratory makeup will be allowed except in situations officially recognized by the University. In that case, the laboratory work must be made up by arrangement with your instructor before your next scheduled laboratory period. Grades for the laboratory work will be determined in part by laboratory reports (about one for each laboratory topic), in part by your work in the laboratory and in part by your work in answering the prediction and other questions turned in before lab. The predictions and questions assigned by your TA must be turned in **no later than 24 hours before** the laboratory time each week. The specific part of the laboratory for which you will write a report will be assigned to you by your TA at the end of each laboratory topic (about every three weeks). Reports should be about 4 but no shorter than 3 typed double-spaced pages (using a word processor is required and such facilities are supplied by the University) including all necessary predictions, graphs, data tables, and calculations. Reports must be delivered to your laboratory instructor for grading no more than **one week after they are assigned**. Late reports will not be accepted. Graded reports will be returned to you not later than your next laboratory meeting. Your first report (and only the first one) may be revised based on instructor comments to achieve a higher grade. The revised report must be given to your laboratory instructor **within two days**. More details of the laboratory grading will be given to you before your first report is assigned. There is also general information about grading in the introduction to your laboratory manual however this syllabus, and information given to you by your TA supersedes any due date or other grading information. Remember this is a writing intensive course so your grade will depend on your communication skills.

**Important**: you may not use data collected by another person as part of your lab report. You must attend each lab and it will be considered plagiarism if you turn in a lab report that utilizes someone else’s data. Even within your group, you must copy down in your own lab manual the data obtained in the experiment. You may not split tasks and send each other data for a given task. If the data is recorded digitally, each student in the group must take the time to inspect the data before it is printed and/or emailed to the group. These are habits that will be very important in your future careers if you plan to work in any data-related field.

**Quizzes**: There will be **four quizzes**. The first part of each quiz will be a group quiz during the discussion section on the quiz week. The second part will be a lecture hour quiz and will occur during lecture time on the same week. The lecture hour part of the quiz is 75% of the quiz grade (25% for problem 1, 25% for problem 2, 25% for multiple choices), while the discussion section part of the quiz is the remaining 25%. **No make-up quizzes** are given. A valid photo ID is required on exam days. Examples of a valid ID are a University ID or Driver’s License.
You can prepare one handwritten 8½ inch by 11 inch (double-sided) sheet of equations (only equations are allowed, no examples, etc.). No books or other notes are allowed. Only a TI-30xa or equivalent simple scientific pre-approved calculator is allowed. No graphing or programmable calculators are permitted. The use of any communication devices (cell phones, messaging devices, etc.) during examinations is not allowed. If you must have a translation device, you must bring a paper dictionary and you must sit in the front row for the exams.

To be successful in problem solving you must get the physics right and communicate your understanding clearly and effectively. To receive full credit on any problem, your solution must be complete and understandable to the grader, with clear algebraic formulation of the physics, explicit definitions of all the symbols used, and proper handling of units and significant figures. In general, problems must be solved algebraically before numbers are substituted (one exception is that plugging in zero should be done when appropriate to simplify the algebra).

**Grades:** The University policy on grades defines the level of achievement for the different grades as follows: **A** - Represents achievement that is outstanding relative to the level necessary to meet course requirements, **B** - Represents achievement that is significantly above the level necessary to meet course requirements, **C** - Represents achievement that meets the course requirements in every respect, **D** - Represents achievement that is worthy of credit even though it fails to meet fully the course requirements. We compute a final score using two methods, and your grade will be based on the greater of these two scores.

**Method 1:**
- 5% for In Class Questions
- 30% for the laboratory. Completion of all labs, and a lab grade of at least 60% will be required to pass the course.
- 30% for best 3 out of 4 quizzes (10% per quiz, including both the lecture and discussion section parts of the quiz).
- 35% for the final examination.

**Method 2:**
- 5% for In Class Questions
- 30% for the laboratory. Completion of all labs, and a lab grade of at least 60% will be required to pass the course.
- 40% for the 4 quizzes (10% per quiz, including both the lecture and discussion section parts of the quiz).
- 25% for the three-hour final examination.

**As a reflection of this your course grade will be calculated on a scale, as follows:**

**A:** a total score of 85%–100%; **B:** 70%–84%; **C:** 55%–69%; **D:** 40%–54%; **F:** less than 40% or a laboratory grade of less than 60%

The dividing lines will not be adjusted upwards, but may be adjusted a point or two downwards. Note for example that B includes B+, B, B-. I will not specify the ± dividing lines in advance.
The quiz and final scores will not be curved or normalized to averages, but will likely to be normalized to the highest score.

**Make up quizzes:** There will be no make up quizzes. If you have a University acceptable excuse, your other quizzes and the final will carry more points. You also have an option of dropping one of the quizzes for any reason. If you are a student athlete and are out of town during the quiz due to a University sanctioned event, you should arrange for one of your coaches to pick up the quiz from the front office just before you leave town. Accommodations will be made for official university sports only (i.e. no accommodations will be made for intramurals, club sports, etc.) Your athletic organization will then administer the test at the same time the class takes it. They will then fax your solutions back to the front office in time for them to be graded with the rest of the class. A coach will then return the original of the student solution to the front office as soon as the team returns to town. The course instructor must be notified at the beginning of the semester or as soon thereafter as possible (no less than three weeks in advance) about conflicts due to scheduled, official University activities, or religious holidays.

**Make up final:** There will be no early finals given for any reason. To get a make-up final you must have two finals scheduled at the same time, 3 finals scheduled on the same day, or a University sanctioned excuse, and must submit a request form no later than two full weeks before the scheduled exam date. If you cannot take a final the next morning, you can wait until the next semester and take the final with the next class.

**Make up labs:** There will be no make up labs. If you have acceptable University excuse you can attend another lab section that same week. You will need to contact your TA to arrange this. If the lab is overcrowded, your request may be denied.

**Make up recitations:** There will be no make up recitations. Unless you have a University acceptable excuse, for each missed recitation you will lose 50% of your group score on the upcoming quiz.

**Make up ICQ:** Since the answers for ICQ will be displayed in real time there is no make up possible.

**Announcements:** It is occasionally necessary to change schedules, including the date of quizzes. Students are responsible for ALL announcements made by email, during the lecture, recitation or laboratory period. For your convenience, I will try to post most important announcements on the class web page. Missing an announcement is not an acceptable excuse for missing a quiz or a course related deadline. It is the sole responsibility of any student missing a lecture to determine what course material and announcements were missed.

**Students with disabilities:** Students with disabilities that affect their ability to participate fully in class or to meet all course requirements are encouraged to bring this to the attention of Disabilities Services so that appropriate accommodations can be arranged. Please provide the staff in physics front office with a copy of your accommodation letter for the current semester.
**Resolving Disputes:** If you have a dispute about a grade, your first address is your TA. He will either explain to you the criteria set for grading or will forward your complaint to the TA who graded the problem. If you were still not satisfied with the response you got from the TA I will be glad to sort it out.

**Responsibilities:** The U of M assumes that all students enroll in its programs with a serious learning purpose and expects them to be responsible individuals who demand of themselves high standards of honesty and personal conduct. All students are expected to behave at all times with respect and courtesy toward their fellow students and instructors and are expected to have the highest standards of honesty and integrity in their academic performance. Any behavior which disrupts the classroom learning environment or any attempt to present work that the student has not actually prepared as their own work, or to pass an examination by improper means, is regarded as a serious offense which may result in the expulsion of the student from the University. The minimum penalty for such an offense is a failing grade for this course. Aiding and abetting the above behavior is also considered a serious offense resulting in equally severe penalties. Open-Door Policy: If any difficulties or problems arise in this course that interfere in any way with your learning or optimum performance, please stop by or send an email to me or to any of the TAs. We will do our best to deal with problems promptly and effectively.

**Academic Integrity:** All work that you turn in for a grade must be your own. The following behaviors are considered to be cheating.

a. Copying all or part of an answer to an in-class question
b. Copying all or part of a lab report, data table or fabrication of data (see Intro, pg. 3 of Lab Manual)
c. Copying all or part of a homework assignment or exam
d. Any other matter covered by the University statement below.

Your TAs are observant. They notice duplication in lab reports and quiz problems. If you have any questions or uncertainties about what is permitted and what is not allowed, please discuss them with the instructor. The use of cell phones or the sending of text messages during a quiz or an exam will be understood to be an act of academic dishonesty and shall be grounds for awarding a grade of F or N for the course.

**Liberal Education Core Requirement:** This class satisfies the University of Minnesota Liberal Education requirement of a physical science course with a laboratory component, as part of the Liberal Education Core. Discoveries and inventions that have profoundly altered the course of human history arose from the physical sciences. As citizens and voters (whether in the United States or in another country), today’s students will be called upon to make decisions on such topics as global climate change, alternative energy sources and resource management. A familiarity with the methods and findings of the physical sciences has never been more important and forms a crucial component of a common education.

This class will expose the student to physical principles and concepts, demonstrate how these principles can be applied to quantitatively describe natural phenomena, and provide the student with an opportunity to perform hands-on experiments and measurements that replicate how physical knowledge is obtained. The fundamental physical principles that underlie our understanding and mastery of the natural world are explored – no engineering or physical science
career is possible without a solid foundation in the physics concepts examined in this course. The basic principles of classical mechanics, and conservation principles will be described with particular emphasis to their application in current technology, using mathematical analysis at the level of basic calculus. Newton’s laws of motion in one and two dimensions will be explained, along with the principles of conservation of energy, conservation of momentum and conservation of angular momentum. Concepts to be examined in depth may include torques in statics and rotational dynamics, elastic and inelastic collisions, and simple harmonic motion and oscillations.

All knowledge in the physical sciences is empirically acquired, and a proper exposure to the ways of knowing and thinking in the physical sciences requires a laboratory component to any formal coursework. The lab component of the class will give you experience in making predictions based upon hypotheses, which are then empirically tested by experiment or observation, through which scientific knowledge is developed. The language of the physical world is mathematical and students will be expected to employ mathematical reasoning in order to solve problems both qualitatively and quantitatively. Physics is a social endeavor, and the student will gain experience in cooperative problem solving, working in small groups with other students, in both the laboratory and Discussion sections of the course.

Policy information

STUDENT CODE OF CONDUCT: You should be familiar with the student code of conduct:

STUDENT RESPONSIBILITIES: You should understand your responsibilities as a student:
https://policy.umn.edu/education/studentresp