Physics 102: Introductory Physics II
Section A – 4 Credits
CARROLL UNIVERSITY
COLLEGE OF NATURAL SCIENCES
Dept. of Cmp & Phys Sci
Spring, 2017

Course Description
The second course of a non-calculus two-course sequence in the basic principles of Physics covering the general areas of wave motion (oscillations, waves and sound), light and optics, and electromagnetism. The mathematical proficiency expected for this course is algebra and introductory trigonometry. This course satisfies the Physics requirement for some majors, pre-health professional requirements and can be used to satisfy a liberal studies program requirement. The course meets twice per week for lecture/discussion and for two hours of laboratory. *(Prerequisite: PHY101, or permission of department)*

Meeting Dates, Times, & Locations
TR: 4:00 PM – 5:50 PM, Main 301

Instructor
Timothy Hoeller, M.S., Adjunct Faculty
Office: Rankin B04
E-Mail: thoeller@carrollu.edu
Office Hours: Tuesday, 3-4 PM or as arranged

Required Text
Knight et al. 2009, College Physics (3rd edition), Pearson/Addison Wesley
"MasteringPhysics" Access code (see below)
Knight et al. 2009, College Physics, Workbook V-1&2
McDermott et al. 2002, Tutorials in Introductory Physics, (Lab and Homework)

Website
In addition to the course website accessible via the Carroll University Portal (the "eLearning" site), you will also regularly use the Mastering Physics website for online homework and reading quizzes (www.masteringphysics.com). The Mastering Physics "Course ID" for our course is: PHY102SP17CU.
Teaching Goals and Learning Objectives

The following list breaks down the teaching goals (TG) and learning objectives (LO) for Physics 102. These are the skills, facts, and relationships you should understand and be able to apply upon completion of the course.

TG1: Understand fundamental physical quantities (such as mass & charge); you will be able to:
   LO1.1: identify fundamental physical quantities
   LO1.2: describe fundamental physical quantities
   LO1.3: describe unknown fundamental physical quantities in terms on known quantities

TG2: Read & Interpret graphs comparing physical quantities; you will be able to:
   LO2.1: identify the process occurring in a given graph
   LO2.2: describe the process occurring in a given graph
   LO2.3: use graphs of a given quantity to describe the behavior of a related quantity

TG3: Understand the behavior of oscillating systems; you will be able to:
   LO3.1: identify the process occurring in a given system
   LO3.2: describe the process occurring in a given system
   LO3.3: predict the future behavior of various oscillating systems

TG4: Understand the motion of traveling waves; you will be able to:
   LO4.1: identify the properties that affect the motion of traveling waves
   LO4.2: describe the motion of traveling waves and their medium where applicable
   LO4.3: predict the motion of traveling waves entering different media

TG5: Understand the behavior of standing waves; you will be able to:
   LO5.1: identify the properties of given standing wave patterns
   LO5.2: describe the properties of given standing wave patterns
   LO5.3: predict the position of nodes and anti-nodes in various standing wave patterns

TG6: Understand the behavior of light as a ray; you will be able to:
   LO6.1: identify the properties of light when treated as a ray
   LO6.2: describe the properties of light when treated as a ray
   LO6.3: use the ray properties of light to predict the position of an image in simple optical systems

TG7: Understand the behavior of electric charge; you will be able to:
   LO7.1: identify the different types of charges
   LO7.2: describe how electric charge can cause a force
   LO7.3: calculate the force exerted by/on objects with a given electric charge

TG8: Understand the electric field; you will be able to:
   LO8.1: identify the direction and strength of an electric field
   LO8.2: describe the electric field, and how it is related to the electric force
   LO8.3: calculate the electric field at a point in space, given an arrangement of charged objects

TG9: Understand the electric potential; you will be able to:
   LO9.1: identify the sign and strength of an electric potential
   LO9.2: describe the electric potential, and how it related to electric potential energy
   LO9.3: calculate the electric potential at a point in space, given an arrangement of charged objects
TG10: Understand Kirchhoff’s Laws as they related to electric current; you will be able to:
   LO10.1: identify cases in which current flows
   LO10.2: determine the direction of electric current
   LO10.3: qualitatively predict the behavior of circuit elements in a variety of circuits
   LO10.4: use Ohm’s Law to quantitatively predict the behavior of a given circuit

TG11: Understand the magnetic field; you will be able to:
   LO11.1: identify the objects and processes that create a magnetic field
   LO11.2: describe the magnetic field
   LO11.3: calculate the magnetic field at a point in space, given an arrangement of objects

TG12: Understand the force associated with the magnetic field; you will be able to:
   LO12.1: identify the magnetic force
   LO12.2: describe the magnetic force
   LO12.3: calculate the magnetic force exerted by a magnetic field on a given object

TG13: Understand the concept of induction; you will be able to:
   LO13.1: identify induced current(s)
   LO13.2: describe the direction of an induced current
   LO13.3: compare the magnitude and direction of induced currents in different situations

TG14: Understand alternating current systems; you will be able to:
   LO14.1: identify the differences between alternating current systems and direct current systems
   LO14.2: describe the phase of an alternating current system
   LO14.3: predict the behavior of circuit elements in a variety of AC circuits
The following list describes the course objectives (CO) as they pertain to the Liberal Studies Program at Carroll University.

C01: Oral communication skills will be developed through interaction (question & answer) with laboratory and lecture instructors, small group discussions in the laboratory, and tutoring/study sessions with the instructor.

C02: Academic writing skills will be developed and assessed through objective portions of tests, laboratory reports, and assignments.

C03: Critical thinking and problem solving skills will be examined and discussed as necessary skills that scientists need to possess to further the development of experiments, theories, and models which help explain the universe. Students will develop these skills and have them assessed as a result of tests, laboratory activities, and assignments, which will be designed as hypothesis posing and testing activities within which these skills will need to be used.

C04: Understanding contemporary relevance will occur throughout the course as a result of the abundant examples within the textbook that provide a strong tie between both historical and modern physics and the world at large.

C05: Students will observe and begin to understand the importance of knowing that the act of observation affects the value of the measurement. One of the main goals of this class is to help students get a better understanding of the most basic laws of the natural world. Conceptual understanding will be stressed. The “common sense test” will become an invaluable tool for work in both the classroom and lab.

C06: Dimensional analysis as a means of recognizing the appropriateness of an equation will be developed in the laboratory and the classroom. This skill will be both practiced and assessed with assignments, tests, and laboratory activities. The means by which to recognize appropriate scientific theories and models to explain physical events and observations will be developed in the classroom. This skill will be practiced and assessed with assignments, tests, and laboratory activities.

C07: Mathematical skills will be reviewed and/or developed in algebra, scientific notation, unit conversion, vector algebra, and the use of formulas/operational definitions. These skills will be practiced and assessed with assignments, tests, and laboratory activities.
Learning Experiences

Demonstrations

Often, a physical demonstration of a basic Physics principle will be made at the beginning or during the topic of discussion. Demonstrations are always followed by discussion and/or short lectures with related equations and concepts mentioned or taught.

Lecture

Material from the text is generally presented in a lecture format, with the help of "Power Point" intended to highlight the important concepts and illustrate first-hand one or more ways to approach the topics. A portion of the lectures will be spent working example problems (see below). Questions about the material presented in previous sessions and in the text are encouraged and expected. Many topics will be introduced by first asking for student input, understanding or knowledge of the topic.

Example problems and student activities

During every class period as possible, the instructor and students will work on physics example problems related to the current topic. Sometimes the instructor will demonstrate a particular example and other times the students will participate in working the example. A variety of other methods of instruction will be utilized (group exercises, tutoring, classroom recitation, quizzes, and optional student run demo).

Chapter Worksheets

For each chapter to be covered this semester, your instructors will provide you with a short (1-2 page) worksheet. This worksheet will contain important terms, concepts, and/or skills that will be addressed in that chapter. The worksheet will also contain a number of important example problems from the text. The purpose of these worksheets is to help direct the students through the material as they read the chapter. The worksheets will be regularly checked for completeness by your instructor, and should be completed before the lecture begins on a new chapter.

Reading Quizzes

Reading quizzes will be completed online (www.masteringphysics.com) and their due dates/times will be addressed in class. Reading quizzes (like the chapter worksheets) are intended to help students prepare before class, and allow your instructors to make more efficient use of class time. It is strongly suggested that you complete the chapter worksheet before attempting the reading quiz. To account for unforeseen emergencies, computer glitches, and occasional forgetfulness, we will drop your lowest reading quiz grade when determining your final grade.

Attendance

Attendance in this class is tracked for each student by signing an attendance sheet during each class period. Tardiness is a distraction to other students. Missing more than 2 class periods may affect your attendance grade.
Homework Problems

The online homework will consist of 8-10 problems assigned online and due with each chapter. In order to access the homework, you will need an access code for www.masteringphysics.com. The code to register comes with the text (if you purchased it new) or can be purchased online. The course ID for this class Mastering Physics is PHY102SP17CU. Make sure the code you have/purchased is for the correct textbook.

It is suggested that the homework is treated like you are turning them in by doing the problems on paper and entering the answers online. Keep up with the work. About one chapter per week is covered in the lectures. Assignments may be submitted late for reduced credit. In case of any problems with online answers, notification to the instructor is requested with grading of hand-written sheets possible for documented issues of the website. Students find that working additional study questions and problems at the end of each chapter will facilitate learning of the material best for the quizzes and final exam.

NOTE: Any points assigned to Homework do not necessarily correspond with points given for the quizzes and exams.

Laboratories

Laboratory periods will be mainly devoted to using the workbook "Tutorials in Introductory Physics." Students will work in small groups to complete these "Tutorials," which include a variety of thought experiments, conceptual examples, and hands-on experiments. The Laboratory grading system will be discussed in your individual section. It is important to note, however, that while your grade in the laboratory only consists of 15% of your grade (see below), if you do not receive a passing grade ('D' or better) in the lab, then you cannot pass the course. Appeals of this procedure are made to Department Chair.

Additional Resources Outside of Class

There are a variety of ways to get help and have questions answered outside of class. After the text, your primary resource should be the instructor who is available during office hours from 2 P.M. to 3 P.M. on Tuesdays and by appointment. The Learning Commons staffs tutors for this course and their hours will be posted early in the semester. Finally, this course is also supported by SI, and the times/dates of SI sessions will also be presented early-on in the semester.

FOOD/DRINK POLICIES - Eating of light snacks and beverages is allowed during lecture classes so as to not disturb fellow classmates. The students are requested to place all trash in the receptacles. Anyone not following this policy will be subject to having their food/drink privilege suspended.

COURSE NOTES -
When taken in the off-cycle, this class is meant for transfer students, make-ups, re-takes or for those with special departmental permission. The course may be audited. Any complaints of grading go through a process that might be outside of the control of the instructor for which applicable university deadlines apply.
Grading Plan

IN-CLASS QUIZZES: No less than 6 quizzes will be given throughout the course with the lowest quiz score dropped. The quizzes are announced one class period prior and will have questions of comparable format and difficulty as the questions on the exams and worth 20 pts. The quizzes are meant to be a learning experience with grading / discussion immediately after the quiz, which are taken at the beginning of the class period. Students arriving more than 20 minutes late may forfeit that quiz. CHALLENGE: Any student scoring a perfect score on 4 quizzes can exempt themselves from taking subsequent quizzes and the grade earned for the Quiz Grade are all 10% of the course points.

EXAMS: There will be four (4) exams (closed book) covering each of 4 units and a comprehensive final in the course. No make-up exam will be allowed without an appropriate excuse of a doctor’s note or extreme emergency. Since the exams are the best way to determine how well the material is understood, each exam worth 100 pts counts 10% for the final grade with the Final Exam counting more and slightly longer -- worth 120 points. The final exam must be taken and is scheduled during the exam period on Friday, May 5, 2017 at 2:00 P.M.

Grading Summary:

Preparation (Attendance, Chapter Worksheets & Reading Quizzes or Other as arranged) – 7%
Homework (found online) - 15%
Laboratory – 15%
In-Class Quizzes – 8%
Exams – 40%
Final Exam – 15%

Grades are determined by using a weighted average [see the weighted average equation shown below], using the weight for each section listed above. Students are encouraged to calculate their current, estimated grade on their own as often as they like. For final grades, a grade distribution plot is examined with natural breaks and any shifts in mean averages used to determine the final grades.

\[
\text{Grade} = \frac{1}{\text{total weight}} (\text{score}_1 \times \text{weight}_1 + \text{score}_2 \times \text{weight}_2 + \cdots)
\]

Grading Scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100-93</td>
</tr>
<tr>
<td>AB</td>
<td>92-88</td>
</tr>
<tr>
<td>B</td>
<td>87-83</td>
</tr>
<tr>
<td>BC</td>
<td>82-78</td>
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<tr>
<td>C</td>
<td>77-70</td>
</tr>
<tr>
<td>D</td>
<td>69-60</td>
</tr>
<tr>
<td>F</td>
<td>59 and below</td>
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</tbody>
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Statement on Academic Integrity

The Carroll University Academic Integrity Policy is located in the student handbook and familiarity with this policy is expected. If a student violates this policy, the instructor reserves the right to impose a sanction of failure on the assignment/lab/assessment or a failure in the course as reported to the appropriate office of Student Faculty Ethics Committee.

Accommodation for Disabilities

Any requests for accommodation must be made through the Disability Services Coordinator in the Walter Young Center (262-524-7335). Appropriate accommodations will be made once notification has been received from the Walter Young Center.
Disclaimer

The instructor and the University reserve the right to modify, amend, or change the syllabus (course requirements, grading policy, etc.) as the curriculum and/or program require(s).

**See Course Overview below and Instructor provided schedules for each learning unit**

**Course Overview:**

**This overview is tentative and subject to change. The instructor will inform students of changes as soon as possible.**

<table>
<thead>
<tr>
<th>Week:</th>
<th>Topics, Exams, Quizzes, Notes</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/24-1/26</td>
<td>101 Review, Oscillations &lt;br&gt;Ch 14 Reading Quiz</td>
<td>Chap. 14</td>
</tr>
<tr>
<td>1/31-2/2</td>
<td>Oscillations, Traveling Waves &amp; Sound &lt;br&gt;Ch 15 Reading Quiz</td>
<td>Chap. 14, 15</td>
</tr>
<tr>
<td>2/7-2/9</td>
<td>Traveling Waves &amp; Sound, Standing Waves &lt;br&gt;Ch 16 Reading Quiz</td>
<td>Chap. 15, 16</td>
</tr>
<tr>
<td>2/14-2/16</td>
<td>Review, Exam Part IV, Standing Waves, Wave Optics &lt;br&gt;Ch 17 Reading Quiz</td>
<td>Chap. 16, 17</td>
</tr>
<tr>
<td>2/21-2/23</td>
<td>Wave Optics, Ray Optics, Optical Instruments &lt;br&gt;Ch 18/19 Reading Quiz</td>
<td>Chap. 17-19</td>
</tr>
<tr>
<td>2/28-3/2</td>
<td>E-M Waves (25.7), Review, Exam Part V (mid-term) &lt;br&gt;Ch 20 Reading Quiz</td>
<td>Chap. 20</td>
</tr>
<tr>
<td>3/7-3/9</td>
<td>Electric Fields and Forces, Electric Potential &lt;br&gt;Ch 21 Reading Quiz</td>
<td>Chap. 20, 21</td>
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<tr>
<td>3/12-3/18</td>
<td>Spring Break (No Classes)</td>
<td></td>
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<tr>
<td>3/21-3/23</td>
<td>Electric Potential, Current and Resistance &lt;br&gt;Ch 22 Reading Quiz</td>
<td>Chap. 21, 22</td>
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<tr>
<td>3/28-3/30</td>
<td>Current and Resistance, Circuits &lt;br&gt;Ch 23 Reading Quiz</td>
<td>Chap. 22, 23</td>
</tr>
<tr>
<td>4/4-4/6</td>
<td>Circuits, Magnetic Fields and Forces &lt;br&gt;Ch 24 Reading Quiz</td>
<td>Chap. 23, 24</td>
</tr>
<tr>
<td>4/10-4/13</td>
<td>Exam Part VI (TBD), Magnetic Fields and Forces</td>
<td>Chap. 24</td>
</tr>
<tr>
<td>4/18-4/20</td>
<td>Electromagnetic Induction &lt;br&gt;Ch 25 Reading Quiz</td>
<td>Chap. 25</td>
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<tr>
<td>4/25-4/27</td>
<td>Electromagnetic Induction, AC Circuits &lt;br&gt;Ch 26 Reading Quiz</td>
<td>Chap. 25, 26</td>
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<tr>
<td>5/2</td>
<td>AC Circuits, Course Wrap-up and Review</td>
<td>Chap. 26</td>
</tr>
<tr>
<td>5/5</td>
<td>FINAL EXAM (2:00 PM)</td>
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</tbody>
</table>

April 5 – Last day to make changes
Physics 102L: Introductory Physics Lab  
CARROLL UNIVERSITY  
COLLEGE OF ARTS & SCIENCES  
Spring, 2017

Meeting Dates, Times, & Locations  
W: 4:00 PM – 5:50 PM in Rankin B04

Instructor  
Robert Drew  
Office: Rankin B04  
E-Mail: rdrew@carrollu.edu  
Office Hours: TBA, and by appointment

Required Text  
Knight et al. 2009, College Physics, Workbook V-1&2  
McDermott et al. 2002, Tutorials in Introductory Physics, (Lab and Homework)

Learning Experiences

Attendance/Participation  
Each week in lab you and your group will submit a "Group Participation Form." This form will be used to monitor your progress during the lab period as well as give the group the opportunity to evaluate the participation of all members. Weekly attendance in lab is required, however should any unforeseen events occur and you miss a lab, please e-mail the lab coordinator, Greg Gabrielsen (ggabriel@carrollu.edu) and schedule a make-up as soon as possible. In the case that a student attends a make-up session, that student will turn in their homework to be graded independently. Each student will be limited to only 2 make-ups over the course of the semester and this policy is to be used only in the case of unforeseen events like emergencies and illness, students who abuse this policy may have it revoked.

Homework  
Each week students will be asked to complete a homework assignment that relates to the topics discussed during the lab period. The groups are strongly encouraged to work on the homework together, but all students are expected to have a completed assignment on the due date. In order to encourage this, all homework assignments will be collected by the lab instructor each week, but only one from each group will be graded, with all members of the group sharing the same grade. Homework assignments will usually be due one week after they are assigned.
Grading Plan

Your grade in Lab will depend on the two factors listed above: Attendance/Participation and Homework. These two factors will be weighted as follows: Attendance/Participation – 25%, Homework – 75%. To account for unforeseen circumstances, we will drop the lowest score for each student at the end of the semester. Finally, please note that a failing grade in the lab portion of Physics 102 will result in a failing grade for the entire course.

Your Attendance/Participation grade will be determined by the participation form turned in by your group. The participation forms will include an area for you and your group to allocate points for the lab as well as an area for the instructor to sign off on your progress through the different structured lab activities. Your Homework grade will be determined by the score of the randomly selected homework graded by the instructor. Homework is due at the beginning of the following week's lab and all group members are expected to complete the homework. The instructor will collect all the homework from a group, and randomly select one to be graded. The two scores (Attendance/Participation and Homework) will be weighted and combined to form a single score for the week. To account for unforeseen circumstances, we will drop the lowest week's score for each student at the end of the semester. Please note that a failing grade in the lab portion of Physics 102 will result in a failing grade for the entire course.

Course Overview:

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<table>
<thead>
<tr>
<th>Date</th>
<th>Topics, Exams, Quizzes, Notes</th>
<th>Readings/Resources</th>
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</thead>
<tbody>
<tr>
<td>1/25</td>
<td>Lab 1 (WB Ch 14, Handout)</td>
<td>Chap. 14</td>
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<tr>
<td>2/1</td>
<td>Lab 2 (Tut. 137-140)</td>
<td>Chap. 15</td>
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<tr>
<td>2/8</td>
<td>Lab 3 (Tut. 141-144)</td>
<td>Chap. 16</td>
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<tr>
<td>2/15</td>
<td>Lab 4 (WB Ch 17, Handout)</td>
<td>Chap. 17</td>
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<tr>
<td>2/22</td>
<td>Lab 5 (WB Ch 18, Handout)</td>
<td>Chap. 18, 19</td>
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<tr>
<td>3/1</td>
<td>Lab 6 (Tut. 71-76)</td>
<td>Chap. 20</td>
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<tr>
<td>3/8</td>
<td>Lab 7 (Tut. 78-79, 85-90)</td>
<td>Chap. 20, 21</td>
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<td>3/15</td>
<td>No Labs (Spring Break)</td>
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<tr>
<td>3/22</td>
<td>Lab 8 (Tut. 97-102)</td>
<td>Chap. 22</td>
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<td>3/29</td>
<td>Lab 9 (Tut. 103-106)</td>
<td>Chap. 22, 23</td>
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<tr>
<td>4/5</td>
<td>Lab 10 (Tut. 119-123)</td>
<td>Chap. 24</td>
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<tr>
<td>4/12</td>
<td>Lab 11 (WB Ch 24)</td>
<td>Chap. 24</td>
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<td>4/19</td>
<td>Lab 12 (Tut. 125-128)</td>
<td>Chap. 25</td>
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<tr>
<td>4/26</td>
<td>Lab 13 (Tut. 129-134)</td>
<td>Chap. 25, 26</td>
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<tr>
<td>5/3</td>
<td>Lab 14 (WB 25&amp;26, Handout)</td>
<td>Chap. 25, 26</td>
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</tbody>
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