Physics 101: Introductory Physics I
Section A – 4 Credits
CARROLL UNIVERSITY
COLLEGE OF ARTS & SCIENCES
Spring, 2017

Course Description
The first course of a non-calculus two-course sequence in the basic principles of physics covering the general areas of mechanics, heat, thermal properties, and fluids. The mathematical proficiency expected for this course is algebra and basic 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 for four hours of lecture/discussion and two hours of laboratory per week. (Prerequisite: MAT101 or higher, or permission of instructor)

Meeting Dates, Times, & Locations
MWF: 8:00 AM – 9:10 AM in Main B11

Instructor
Gregory Gabrielsen
Office: 206 Charles, Room 102
E-Mail: ggabriel@carrollu.edu
Office Hours: TBA

Required Text
Knight et al. 2014, College Physics (3rd edition), Pearson/Addison Wesley
"MasteringPhysics" Access code (see below)
Knight et al. 2014, College Physics, Workbook V-1&2
McDermott et al. 2002, Tutorials in Introductory Physics, (Lab and Homework)
RF Response Card (Clicker) or ResponseWare App

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 (www.masteringphysics.com). The Mastering Physics site will host the online homework and reading quizzes, which are described below. The Mastering Physics "Course ID" for our course is: CUPHY101SP17
Goals and Learning Objectives

The following list breaks down the teaching goals (TG) and learning objectives (LO) for Physics 101. 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; 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: Apply the relationships between kinematic variables; you will be able to:
   LO2.1: identify kinematic variables
   LO2.2: describe kinematic variables
   LO2.3: use kinematic variables to solve 1-D and 2-D motion problems

TG3: Interpret graphs comparing physical quantities; you will be able to:
   LO3.1: identify the process occurring in a given graph
   LO3.2: describe the process occurring in a given graph
   LO3.3: use graphs of a given quantity to describe the behavior of a related quantity

TG4: Understand the different types of forces; you will be able to:
   LO4.1: identify the different types of forces
   LO4.2: describe the different types of forces

TG5: Apply Newton's Laws of Motion to translational motion; you will be able to:
   LO5.1: identify Newton's Laws of Motion
   LO5.2: describe Newton's Laws of Motion
   LO5.3: use Newton's Laws of Motion to solve 1-D and 2-D translational motion problems

TG6: Apply the relationships between rotational kinematic variables; you will be able to:
   LO6.1: identify rotational kinematic variables
   LO6.2: describe rotational kinematic variables
   LO6.3: use rotational kinematic variables to solve 1-D rotational motion problems

TG7: Apply Newton's Laws of Motion to rotational motion; you will be able to:
   LO7.1: identify Newton's Laws of Motion for rotational motion
   LO7.2: describe Newton's Laws of Motion for rotational motion
   LO7.3: use Newton's Laws of Motion to solve 1-D rotational motion problems

TG8: Apply the Principle of Momentum Conservation to a system, you will be able to:
   LO8.1: identify the situations where momentum is conserved in a system
   LO8.2: describe what constraints must be present for momentum to be conserved
   LO8.3: use the Principle of Momentum Conservation to solve motion problems

TG9: Understand the different types of energy; you will be able to:
   LO9.1: identify the different types of energy
   LO9.2: describe the different types of energy

TG10: Apply the Work-Energy Theorem to a system; you will be able to:
   LO10.1: identify the Work-Energy Theorem
   LO10.2: describe the Work-Energy Theorem
   LO10.3: use the Work-Energy Theorem to determine the behavior of a system
TG11: Apply your knowledge of motion to systems of atoms; you will be able to:
   LO11.1: identify the states of matter and atoms act in each
   LO11.2 describe the states of matter and how atoms act
   LO11.3: use previously discussed principles to describe changes in matter

TG12: Apply your knowledge of motion to fluid; you will be able to:
   LO12.1: identify the physical quantities that effect fluids
   LO12.2: describe the effects on fluids by these quantities
   LO12.3: use previously discussed principles to describe and predict the behavior of fluids

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

Lecture
Your instructor will present the material from the text in a lecture format, often with the help of PowerPoint, 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. Questions about the material presented in previous sessions and in the text are encouraged and expected. Your instructor will often do a physical demonstration of a basic physics principle in the front of the classroom at the beginning or during the discussion of a new topic. Demonstrations are always followed by discussion and a short lecture with the related equations and concepts.

During every class period both the instructor and the students will work on physics example problems related to the current topic. Sometimes the instructor will demonstrate a particular example, but most often the students will participate in working the example. We will also utilize the clickers to obtain feedback on the problems worked in class. Your responses to these questions will be factored into the “Preparation” portion of your final course grade (see below).

Chapter Worksheets
For each chapter to be covered this semester, your instructors will provide you with a short (1-2 page) worksheet that can be found on the eLearning page for the class. 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 lecture will be tracked for each student through their “clicker”. To account for unforeseen emergencies, illnesses, and the like you will be permitted to miss 3 days of class before your attendance grade is affected.

Homework Problems
The online homework will consist of 8-10 problems assigned online and due weekly, usually Wednesday evenings. In order to access the online 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 our class on MasteringPhysics is CUPHY101SP17. Make sure the code you have/purchase is for the correct textbook.
We suggest that you try to treat the online homework like you were doing problems to turn in. Do them on paper and then enter in the answers online. Assignments may be submitted late for reduced credit. Finally, if you feel the grade you received online is inaccurate or undeserved, you may submit your written work (with your name) and the instructor will grade it by hand. In addition to the assigned problems, additional study questions and problems are located at the end of each chapter of the text as well as in workbook.

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 laboratory only consists of 15% of your grade (see below), if you do not receive a passing grade (‘D’ or better) in lab you cannot pass the course. For example, if a student gets 100% in all of his/her class assignments but gets a 0% in lab, the total numeric grade would be 85%; the student would still receive a failing grade.

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 his office hours or by appointment. Posted office hours may be held in the lab room to encourage and allow for group work. 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 in the semester.

Grading Plan
In-Class Quizzes
During the Friday class meeting each week, there will be a short quiz, reviewing the material discussed during the week. The quizzes will have questions of comparable format and difficulty to the questions on the exams. The quizzes will be short (3 or so questions, 10 minutes) and are meant to help prepare students for the Midterm and Final Exams.

Exams
There will be two midterm exams and a comprehensive final exam in the course. Each exam will cover all material presented up to that point in class. The exams are tentatively scheduled for the Friday of the week in which they are listed in the course overview below, with make-up exam dates only permitted in extreme circumstances. The date and time of the final is also listed in the course overview. Exams are closed book, but useful equations will be provided with the exam. The exams are the best way to determine how well you understand the material therefore the exams are a significant factor in determining your grade.
Grading Summary:

Preparation (Attendance, Chapter Worksheets, & Reading Quizzes) – 8%
Online Homework - 12%
Laboratory – 15%
In-Class Quizzes – 10%
Midterm Exams – 35%
Final Exam – 20%
(This is an approximate point distribution. Point totals/weights may change as appropriate.)

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 grade on their own as often as they like. The instructor is always happy to help students do this. Just ask!

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

Grading Scale:

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

Odds & Ends

Course Goals
Students completing this course will obtain a general understanding of the physical concepts that govern the movement of particles and rigid bodies, and be able to quantify those concepts in terms of kinematic variables (displacement, velocity, and acceleration), momentum, and/or energy. Students will be prepared to apply these concepts to oscillating systems (as covered in PHY102) as well as re-evaluate the relationships between these concepts in terms of Electro-Magnetic systems (also covered in PHY102).

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

Statement on Academic Integrity
The Carroll University Academic Integrity Policy is located in your student handbook. You are encouraged to become familiar with the policy. If a student violates this policy in any way, the instructor reserves the right to impose a sanction of failure on the assignment, lab, or assessment and/or failure in the course.
**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 of:</th>
<th>Topics, Exams, Quizzes, Notes</th>
<th>Readings/Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/24-1/27</td>
<td>Intro Day, Representing Motion Ch 1 Reading Quiz</td>
<td>Chap. 1</td>
</tr>
<tr>
<td>1/30-2/3</td>
<td>Representing Motion, 1-D Motion Ch 2 Reading Quiz</td>
<td>Chap. 1,2</td>
</tr>
<tr>
<td>2/6-2/10</td>
<td>1-D Motion, Vectors and 2-D Motion Ch 3 Reading Quiz</td>
<td>Chap. 2,3</td>
</tr>
<tr>
<td>2/13-2/17</td>
<td>Vectors and 2-D Motion, Forces and Newton's Laws Ch 4 Reading Quiz</td>
<td>Chap. 3,4</td>
</tr>
<tr>
<td>2/20-2/24</td>
<td>Forces and Newton's Laws, Applying Newton's Laws Ch 5 Reading Quiz</td>
<td>Chap. 4,5</td>
</tr>
<tr>
<td>2/27-3/3</td>
<td>Applying Newton's Laws EXAM #1</td>
<td>Chap. 5</td>
</tr>
<tr>
<td>3/6-3/10</td>
<td>Circular Motion Ch 6 Reading Quiz</td>
<td>Chap. 6</td>
</tr>
<tr>
<td>3/13-3/17</td>
<td>No Classes (Spring Break)</td>
<td></td>
</tr>
<tr>
<td>3/20-3/24</td>
<td>Rotational Motion Ch 7 Reading Quiz</td>
<td>Chap. 7</td>
</tr>
<tr>
<td>3/27-3/31</td>
<td>Rotational Motion, Equilibrium, Momentum Ch 8 Reading Quiz, Ch 9 Reading Quiz</td>
<td>Chap. 7-9</td>
</tr>
<tr>
<td>4/3-4/7</td>
<td>Momentum, Energy &amp; Work Ch 10 Reading Quiz</td>
<td>Chap. 9,10</td>
</tr>
<tr>
<td>4/10-4/14</td>
<td>Energy &amp; Work (No Classes Friday, 4/14)</td>
<td>Chap. 10</td>
</tr>
<tr>
<td>4/17-4/21</td>
<td>Energy &amp; Work, Using Energy EXAM #2, Ch 11 Reading Quiz</td>
<td>Chap. 10,11</td>
</tr>
<tr>
<td>4/24-4/28</td>
<td>Thermal Properties of Matter Ch 12 Reading Quizzes</td>
<td>Chap. 12</td>
</tr>
<tr>
<td>5/1-5/3</td>
<td>Fluids, Course Wrap-up Ch 13 Reading Quiz</td>
<td>Chap. 13</td>
</tr>
<tr>
<td></td>
<td>FINAL EXAM (8:00 AM)</td>
<td>Chap. 1-13</td>
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</tbody>
</table>

**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).
Physics 101L: Introductory Physics Lab
CARROLL UNIVERSITY
COLLEGE OF ARTS & SCIENCES
Spring, 2017

Required Text
   Knight et al. 2014, College Physics, Workbook V-1&2
   McDermott et al. 2002, Tutorials in Introductory Physics, (Lab and Homework)

Learning Experiences

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.

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, the instructors understand that unforeseen events may occur. With that in mind, we
offer two possible solutions. First, if you miss your lab section, but can make it up at a later
section that week, please do so. Simply e-mail your lab instructor to inform them of your plan
and bring a lab make-up sheet (available on the lab course website) to the lab you do attend. If
you miss a lab and cannot make a later lab time, please e-mail the lab coordinator, Greg
Gabrielsen (ggabriel@carrollu.edu) and schedule a make-up ASAP. In the case that a student
attends a different lab section or a scheduled 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.

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%. 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 score in each category for each student at the end of the semester. Finally,
please note that a failing grade in the lab portion of Physics 101 will result in a failing grade for
the entire course
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 of:</th>
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<th>Readings/Resources</th>
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</thead>
<tbody>
<tr>
<td>1/24-1/27</td>
<td><strong>No Labs</strong></td>
<td></td>
</tr>
<tr>
<td>1/30-2/3</td>
<td>Lab #1 (Motion Graphs, Handout)</td>
<td>Chap. 1,2</td>
</tr>
<tr>
<td>2/6-2/10</td>
<td>Lab #2 (1-D Motion, Tut 11-14)</td>
<td>Chap. 2</td>
</tr>
<tr>
<td>2/13-2/17</td>
<td>Lab #3 (2-D Motion, Tut 15-18)</td>
<td>Chap. 3</td>
</tr>
<tr>
<td>2/20-2/24</td>
<td>Lab #4 (Forces 1, Tut 25-30)</td>
<td>Chap. 4</td>
</tr>
<tr>
<td>2/27-3/3</td>
<td>Lab #5 (Forces 2, Tut 31-34)</td>
<td>Chap. 4,5</td>
</tr>
<tr>
<td>3/6-3/10</td>
<td>Lab #6 (Circular Motion, WB Ch 6)</td>
<td>Chap. 6</td>
</tr>
<tr>
<td>3/13-3/17</td>
<td><strong>No Labs (Spring Break)</strong></td>
<td></td>
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<tr>
<td>3/20-3/24</td>
<td>Lab #7 (Rotational Motion, WB, Ch. 7)</td>
<td>Chap. 6,7</td>
</tr>
<tr>
<td>3/27-3/31</td>
<td>Lab #8 (Torque &amp; Equilibrium, WB, Ch. 7&amp;8)</td>
<td>Chap. 7,8</td>
</tr>
<tr>
<td>4/3-4/7</td>
<td>Lab #9 (1-D Momentum, Tut 49-52)</td>
<td>Chap. 9</td>
</tr>
<tr>
<td>4/10-4/14</td>
<td>Lab #10 (Work-Energy, Handout)</td>
<td>Chap. 10</td>
</tr>
<tr>
<td>4/17-4/21</td>
<td>Lab #11 (Thermal Energy, WB Ch. 10&amp;11)</td>
<td>Chap. 10,11</td>
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<tr>
<td>5/1-5/3</td>
<td>Lab #13 (Buoyancy, Tut 223-226)</td>
<td>Chap. 13</td>
</tr>
</tbody>
</table>


**Lab Sections Addendum**

The matrix below notes the various lab sections, for which the student should be enrolled and registered for one. All lab sections meet in Rankin B04 at the date/time listed below.

<table>
<thead>
<tr>
<th>Sec</th>
<th>Day/Time</th>
<th>Instructor (Office Hours)</th>
<th>e-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Monday, 2-4 PM</td>
<td>Gabrielsen (TBA)</td>
<td><a href="mailto:ggabriel@carrollu.edu">ggabriel@carrollu.edu</a></td>
</tr>
<tr>
<td>B</td>
<td>Monday, 4-6 PM</td>
<td>Lenz (by appointment)</td>
<td><a href="mailto:dlenz@carrollu.edu">dlenz@carrollu.edu</a></td>
</tr>
<tr>
<td>C</td>
<td>Monday, 6-8 PM</td>
<td>Lenz (by appointment)</td>
<td><a href="mailto:dlenz@carrollu.edu">dlenz@carrollu.edu</a></td>
</tr>
<tr>
<td>D</td>
<td>Tuesday, 8-10 AM</td>
<td>Gabrielsen (TBA)</td>
<td><a href="mailto:ggabriel@carrollu.edu">ggabriel@carrollu.edu</a></td>
</tr>
<tr>
<td>E</td>
<td>Tuesday, 10-12 PM</td>
<td>Gabrielsen (TBA)</td>
<td><a href="mailto:ggabriel@carrollu.edu">ggabriel@carrollu.edu</a></td>
</tr>
<tr>
<td>F</td>
<td>Tuesday, 12-2 PM</td>
<td>Wilson (TBA)</td>
<td><a href="mailto:twilson@carrollu.edu">twilson@carrollu.edu</a></td>
</tr>
<tr>
<td>G</td>
<td>Tuesday, 2-4 PM</td>
<td>Gabrielsen (TBA)</td>
<td><a href="mailto:ggabriel@carrollu.edu">ggabriel@carrollu.edu</a></td>
</tr>
<tr>
<td>H</td>
<td>Tuesday, 4-6 PM</td>
<td>Greene (TBA)</td>
<td><a href="mailto:sgreene@carrollu.edu">sgreene@carrollu.edu</a></td>
</tr>
<tr>
<td>I</td>
<td>Tuesday, 6-8 PM</td>
<td>Hoeller (TBA)</td>
<td><a href="mailto:thoeller@carrollu.edu">thoeller@carrollu.edu</a></td>
</tr>
<tr>
<td>J</td>
<td>Wednesday, 2-4 PM</td>
<td>Drew (by appointment)</td>
<td><a href="mailto:rdrew@carrollu.edu">rdrew@carrollu.edu</a></td>
</tr>
</tbody>
</table>