CCBC
Spring 2022
SoMS – Physical Science
Fundamentals of Physics - PHYS 101

CC1- 20226

Contents

PHYS 101 - 4 Credits - Fundamentals of Physics I introduces the topics Newtonian kinematics, dynamics, statics, momentum, energy, and heat. This course is appropriate for students interested in health care professional schools (*e.g*., medical, physical therapy, pharmacy, or dental) and for students in technical programs that require non-calculus based physics. Students majoring in engineering, mathematics, or physics may be required to take the PHYS 151, 251, 252 sequence.

4 credits: 3 lecture hours and 3 laboratory hours *per* week. This lab course may be used to fulfill 4 credits of the General Education requirement in Biological and Physical Sciences.

Prerequisites: (MATH 135 with a grade of B or higher, or MATH 163 with a grade of C or higher, or MATH 165 with a grade of C or higher, or any 200-level MATH course) and ((ENGL 052 and RDNG 052) or ACLT 052).

NOTE: You are expected to know the material from your completed prerequisite courses so that you can use those skills in PHYS 101. Prerequisites are not just a box to be checked off.

A. Basic Course Information

1. Instructor: Dr Dave Baum
2. Contact information: Catonsville MASH 016 - (443) 840 – 4341 - DBAUM@CCBCMD.EDU (preferred means) – Course Webpage: http://cwoer.ccbcmd.edu/science/physics/Baum/PHYS101S22/PHYS101S22.html.
3. Office Hours: after class MWF 11:15 – 12:15 TR 1:00 – 2:00.
4. Contact Turn-around Time: I expect to get back to your eMail inquiries within two work days. Phone messages may take up to a week. I do not respond to messages in Brightspace.

5. Catonsville Physical Science Dept: 443-840-4560.
6. Class Times, Days, and Locations: COMBINED LECTURE/LAB MWF 9:05 – 10:55 in C-MASH 038.
7. This is a four credit hour course. For each credit hour, the student is expected to complete at least two hours of work per week outside of the class, including doing homework and practice problem solving, reading, writing laboratory reports, and preparing for exams. Note that these are minimal requirements for any course and that many students require more time than this for science courses.
8. Required Materials:
    a) For laboratory courses, appropriate clothing (including shoes that cover the tops of the feet and have good traction) is required. See "Course Procedures" for more information. In addition, you must come with a mask; additional required PPE will be provided by the College.
    b) Urone and Hinrichs, College Physics, Openstax. The bookstore will sell you a hardbound copy, or you can download a free copy from: https://openstax.org/details/books/college-physics.
    c) The Laboratory Manual is available at the Bookstore. This should be the 2021 version, but if you have an older version, you'll still be O.K.
    d) A cheap scientific calculator that can do trig functions, scientific notation, and natural exponents/logs (about $10). An $80 programmable graphing calculator is not necessary. Cell phone calculators are not allowed during exams.

    Optional Materials:
    e) The textbook study materials, available at https://openstax.org/details/books/college-physics?Student resources.
    f) A pair of safety glasses may be needed for some labs.
    g) It is also recommended that you purchase a regular lined composition book in which to write practice problems.
9. Additional basic information
    a) You may be asked to complete a number of surveys during the semester in addition to the usual course evaluations.
    b) The College requires you to check your College eMail for important messages. Federal regulations require that we must fully determine the identity of the emailing party, and further require that we disclose student information to only the student. In order to meet these requirements for email communication, only emails received from the student's CCBC email account will get a response. Be sure to send ALL email with your CCBC email account to avoid delays in communicating with your instructor.

B. Course Goals Overall

1. Course objectives: Upon completion of this course, the student will be able to:

    a) solve problems by analyzing uniformly accelerated motion;

b) perform vector addition by graphical and component methods;
c) apply Newton's Laws of Motion to problems involving force analysis;
d) develop models from the Force Laws for Work and Energy, Impulse and Momentum;
e) analyze circular motion using centripetal force;
f) apply Newton's Law of Universal Gravitation;
g) use the principle of Conservation of Mechanical Energy in solving problems;
h) use the principle of the Conservation of Linear Momentum in analyzing collisions;
i) analyze rotational motion applying torque and Newton's law ;
j) apply force and torque analysis to static systems;
k) analyze simple harmonic motion;
l) perform a collaborative laboratory investigation
m) use computer-based data collection methods;
n) plot and analyze data using appropriate computer programs and software tools;
o) evaluate the results of experiments in terms of supporting or disproving theoretical concepts;
p) find, evaluate, use and locate appropriate resources, including the accepted values of measured quantities;
q) write coherent laboratory reports;
r) evaluate professional behavior within the scientific community and explain the ramifications of misconduct;
s) properly acknowledge reference sources and others' contributions to collaborative work;
t) compare and contrast the role that Physics has had within various cultures and
u) describe the universal applicability of the laws of physics, making them the intellectual property of all cultures and segments of humankind.

2. Major topics:
   a) Introduction
      i. Standards of length, mass, and time
      ii. Dimensional analysis
      iii. Problem solving strategies
   b) Motion in One Dimension
      i. Linear displacement
      ii. Velocity
      iii. Acceleration
      iv. Freely falling objects
   c) Vectors
      i. Vectors and their properties
      ii. Displacement, velocity, and acceleration in two dimensions
      iii. Motion in two dimensions
   d) Laws of Motion
      i. Newton's first law
      ii. Newton's second law

iii. Newton's third law
iv. Frictional forces

e) Energy
i. Work
ii. Kinetic and gravitational potential energy
iii. Spring potential energy
iv. Conservative and non-conservative forces

f) Momentum and collisions
i. Momentum and impulse
ii. Conservation of momentum
iii. Collisions

g) Rotational Motion
i. Angular speed and angular acceleration
ii. Relations between angular and linear quantities

h) Law of Gravitation
i. Newtonian gravitation
ii. Kepler's laws

i) Rotational Dynamics
i. Torque and equilibrium
ii. Torque and angular acceleration
iii. Angular momentum

j) Oscillations and Mechanical Waves
i. Simple harmonic motion
ii. Waves: frequency, amplitude, and wavelength

k) Sound and Hearing

l) Thermal Physics
i. Temperature
ii. Zeroth Law of Thermodynamics
iii. Thermometers and Temperature Scales
iv. Ideal Gas Law
v. Heat and Internal Energy
vi. Sensible Heat
vii. Specific Heats and Calorimetry
viii. Latent Heat and Phase Changes
ix. Energy Transfer.

m) Global Developments in Physics

3. Rationale

This course is part of a two semester sequence. Since very few of you will continue on in physics, this course is designed to provide you with useful skills in much the same way that a writing course would. It is a vehicle to help you acquire the ability to construct arguments using a logical progression of steps from premise to conclusion and an

exercise in clear and concise expression. In addition, this course specifically demonstrates that there are often several ways to model processes and behavior and provides practice in constructing models and realizing the limitation of those models. It is an opportunity to develop the ability to extrapolate and apply current knowledge to new situations. Lastly, and perhaps least importantly, it is a chance to learn some physics. It is hoped that the specific knowledge and, more importantly, the scientific approach presented in this course will be useful to you not only in your career, but also in making decisions regarding everyday life as well as important issues of the day.

C. Evaluation

1. Requirements:

   a) The four highest scores of the five exams constitute 64% of your final grade; that is to say that your lowest exam grade will be ignored. There will be NO make-up exams; a missed exam will be given a grade of zero, which will then be dropped as your lowest grade. Situations involving two, excusable, missed exams shall be treated on an individual basis. Your fifth regular exam will occur on final day. Exams may cover any material presented in class or in the textbook, unless a section is specifically omitted. A relationship sheet will be provided for your use. Questions on the grading of an exam must be brought to my attention within a week of the exam's return. You may be asked to present a photo ID at each exam. Seating during exams may be assigned.

   b) Homework assignments, in-class quizes, and special projects will total 11%. Expect that an assignment will be due at the beginning of every class day; if the assignment is not announced at the end of class, check your e-mail later in the day. Not all assigned problems will be graded. No late homework will be accepted, but some number of homework grades will be dropped in the same manner as for exams. Answers to all assigned problems will be made available for your inspection.

   c) Laboratory work counts 25%. A maximum of two missed laboratories can be made up per the procedures listed in the lab manual. There will be at least 11 lab exercises; of these, at least six will require formal lab reports.

2. Grading policy:

   Final grades will be calculated as follows:
   ≥ 90% A
   ≥ 80% B
   ≥ 60% C
   ≥ 50% D
   < 50% F

Please note that this system eliminates competition among students, so there is no reason not to help one another. Each student should keep a record of his grades. Students may request an estimated grade at any time.

Also, *please note that a D is a passing grade*; although some programs and courses may require a higher grade, a D will earn you credits toward graduation.

3. Attendance policy:

Attendance is not mandatory, but non-attendance will almost certainly affect how well you perform on assignments. Remember that no late homework assignments or missed exams will be made up, although, some number of homework assignments and your lowest exam grade will be dropped at the end of the semester, and two missed laboratory exercises may be made up near the end of the semester at a common time to be announced. The exception is if you decide to AUDIT the class, in which case attendance becomes mandatory.

4. Audit policy:

You can no longer wait until mid-semester to decide that auditing a course is appropriate; the final date to change to an audit now coincides with the final date for withdrawing with a 50% refund. Failure to participate in the class as an audit will result in a grade of " instead of AU. The last day to change to an 'audit' this semester is: February 18th 2022.

D. Course Procedures

1. Course-related policies and procedures:

a) The class will follow any and all COVID related precautions required by the college. At this point, these include masks at all times, face shields during lab exercises, and cleaning tables both before and after class.
b) Students must take the lab safety quiz and earn at least an 80% in order to participate in lab.
c) Attendance is not mandatory, but no late homework assignments or missed exams will be made up. *Exception: any student registered as an audit must attend regularly; failure to do so will result in a grade change to either W or whichever letter grade is appropriate for the completed work.*
d) You will be given a relationship sheet for each exam; a copy is available through the link on the course webpage. You may also find it helpful when doing your homework assignments. Please feel free to ask for additional relationships *during* the exams if you think you need them to complete a problem.
e) I have not made a detailed list of material to be covered in class, but it is my intention to cover at least Chapters 1 – 11, 13, 16, & 17.

f) Cheating policy: You are permitted, indeed, encouraged, to consult with classmates on labwork and homework. However, presenting another's work as your own is considered cheating. You should therefore always present material from a reference source in your own words and credit that source. Collaboration on exams is not allowed; no cell phone calculators are allowed during exams. Any cases of academic dishonesty will be dealt with according to College policies (see Office of Judicial Affairs: http://www.ccbcmd.edu/judicialaffairs/index.html).

g) In accordance with the Americans with Disabilities Act, CCBC is committed to providing equal access to educational opportunities for all students by arranging support services and reasonable accommodations for students with disabilities. A student with a disability may contact the appropriate campus office for an appointment to discuss reasonable accommodations. An appointment must be scheduled within a time period that allows staff adequate time to respond to the special needs of the student. The student must provide the appropriate office with proper documentation supporting the need for reasonable accommodations. Contact Beth Hunsinger in the Office of Disability Support Services at 443-840-1741. Once you are approved, notify me as soon as possible.

h) There will be no cell phone activity during class. If you are expecting an important call, be sure your phone is on vibrate and take the call in the hall. There will be no cell phone activity at all during exams.

i) A student may not leave the classroom during an exam for any reason. Leaving the classroom means that the exam has been submitted and the student will not be allowed to continue working on the exam upon return. Students should make sure to have all items needed to take the exam and take care of any personal business prior to the start of class on exam days. If there is a medical reason why a student cannot sit for two hours, the student should contact the Office of Disability Support with proper documentation to obtain an accommodation letter. Accommodations are not retroactive.

j) No food or drink is allowed in class. Closed-toed shoes are required to provide protection from broken glass, heavy objects, and other hazards. On occasion, safety glasses will be required during laboratory exercises. Failure to abide by this policy shall result in your removal from the classroom.

k) This class cannot be recorded without my written permission. A request form is available.

l) Anyone who is not officially registered for this class may not attend.

m) Further Remarks about the course:

   i. Why do we require you to take this class? To be honest, you're probably not going to remember much of the material ten years from now. I think of this class as being similar to a writing class, where you learn analytic and communication skills, rather than specific material. This course is:

a. a vehicle to help you acquire or strengthen the ability to construct arguments using a logical progression of steps from premise to conclusion.
b. an exercise in clear and concise expression.
c. a demonstration that there are often several ways to model processes and behaviors (interconnectedness of topics or 'the big picture').
d. practice in constructing models and realizing the limitation of those models.
e. an opportunity to develop the ability to extrapolate and apply current knowledge to new situations.
f. a chance to learn some physics.

ii. What this course is not:
a. an exercise in memorization.
b. simply plugging numbers into equations.
c. a prep course for the MCATs; the MCAT tests to see if you have had a strong Physics course.
d. directly applicable to Radiology (see c.).

iii. Approaches and Methods:
a. The course is structured much like a traditional Geometry class, where we start with two axioms (called 'laws' in Physics) that we assume are true, and build the rest of the course from those laws.
b. Discovery Physics - development of concepts from observations of demonstrations and laboratory experiments
c. Physics by Inquiry - emphasis on discussion - learn from correcting misconceptions or mistakes - re-organizing previous knowledge
d. Socratic Method - 'Ask, don't tell'
e. Direct Transmission - traditional lecture format

iv. Advice from me:

a. It's your responsibility to ensure that you understand the material. If not, bring that to my attention as soon as possible. It you have any deficiencies in your background, *e.g.*, math abilities, get help. Spend enough time on the course to do a good job: 4 credit hours x 3 = 12 hrs/wk *minimum* outside of class. Read the chapter under discussion *before* class. You don't necessarily need to understand it the first time through. Reading the text, taking notes, and doing the assigned homework is *not* enough! In the same way that you can't learn to play the piano by just going to a recital, you can't learn physics by listening to other people talk about it.
b. Be an active learner. Work through each of the book's examples *interactively* as you come to it, and do as many additional problems at the ends of the chapters as you can find time for (use your composition book). The answers to most odd-

numbered problems are at the end of the book. I can help you with any you may have problems with.

c. Interact with your fellow students. Try stuff at home, *e.g.*, measure the period of a pendulum *vs* its length. Think about ways the new material relates to the old. *Think about thinking, e.g.*, did you arrive at this principle through observation? derivation? analogy?
d. Class participation is very important. This allows both of us to get feedback on the level of understanding you have of the material.
e. This course will not be conducted as a standard lecture class, where I "tell" you the material and you regurgitate it back on the exams. Exams will *not* comprise rehashed homework problems, nor will the problems be of the "plug and chug" variety; one goal of this class is to allow you to extend the techniques you have learned to *new* situations. Exam problems usually will involve simple calculations, but will test your ability to decide which fundamental concept of physics to use and how to apply it to each problem. To prepare for the exams, I suggest that you work through the examples in the book and do as many additional problems as you can find time for. The answers to the odd-numbered problems are in the back of the book. You may also like to try the conceptual questions at the ends of the chapters. Try the sample tests on the course website.
f. If you have a question, ASK! There's a very good chance someone else has the same question. I have scheduled office hours. You may also feel welcome to drop by my office any time; if I am free, I will talk with you. I am more than willing to discuss any problems you may have with the homework assignments, even before they are due. You can also use e-mail to ask questions about the course or its material; you will probably get the answer more quickly than by waiting for class to ask me.
g. Free tutoring sessions are available through the Student Success Center in C-LIBR-100: www.ccbcmd.edu/tutoring/cat. Some resources for Math help are attached to this packet.

v. Advice from former students:

a. “Put in as much effort as possible on completing the homeworks alone.”
b. “Try as much as possible to practice homework and examples." “Be prepared. Lectures are usually beginner level and homework is expert level.”
c. “Make sure you understand what is being taught in class before leaving… and seek help when you have to. Don’t wait hoping that you will get it as the class goes on.”
d. “Ask questions every day."
e. "Bring colored pencils."
f. “Form study groups or go to the tutoring center.” “Often, talking about problems and curriculum helps to analyze material more thoroughly.”

2. For college-wide syllabus policies, such as the Code of Conduct for Academic Integrity, Grades and Grading (including FX and progress grades), and the Audit/Withdrawal policies, please go to the MySyllabiPolicies tab on the myCCBC page.

3. To access information about student services, such as Academic Advising, College and Community Outreach/Success Navigators, and Disability Support Services, students may refer to the Student Support Services link on the CCBC catalog home page.

4. Contact information for course-related concerns: Students should first attempt to take concerns to the faculty member. If you are unable to resolve course-related concerns with the instructor, you should contact Dr Erica L. DiCara, Catonsville Physical Science Coördinator, at edicara@ccbcmd.edu, or at (443) 840-4119.

5. Course calendar/schedule

   January 30th – Drop with 100% Refund Deadline
   January 31st – Classes Start
   February 18th –50% Refund Deadline – Audit Deadline
   February 21st – EXAM I
   March 14th – EXAM II
   March 15th –December Graduation Application deadline
   April 4th – EXAM III
   April 9th – 18th – No Classes
   April 20th –Withdrawal Deadline
   April 29th – EXAM IIII
   May 16th – Last Day of Classes
   May 20th – Optional Q Session (9-11)
   May 23rd – EXAM V (10-12)
   October 7th - Incomplete Makeup Deadline

6. Material in Brightspace will be available until September 1st.

This syllabus may be changed with notification to the class.

List of Full URLs used in this document:

CCBC Catalog: http://catalog.ccbcmd.edu/index.php

myCCBC page: https://myccbc.ccbcmd.edu/

Office of Judicial Affairs: http://www.ccbcmd.edu/judicialaffairs/index.html

Course Webpage: http://cwoer.ccbcmd.edu/science/physics/Baum/PHYS101F21/PHYS101F21.htm

Textbook: https://openstax.org/details/books/college-physics

Ancilliary materials: https://openstax.org/details/books/college-physics?Student resources