LB 274, Spring 2016: Physics II
Course Syllabus

Course Description

LB 274 is the second semester of the LBC calculus-based introductory physics sequence, and will be taught by Gerd Kortemeyer, Walt Benenson, and Alanna Pawlak. This course will focus on electricity and magnetism for the most part.

The primary learning goals of this course are:

1. To develop a conceptual understanding of physics and the interconnectedness of physical phenomena.

2. To develop autonomous learning skills, particularly in relation to create a toolkit of representations for expressing and manipulating the laws of physics, which will help you to make quantitative predictions about physical phenomena.

3. To learn to think clearly and simply about the physical world. We will work on increasing problem-solving and modeling skills. Specifically, we will focus identifying the important elements of a problem (in a physics context or otherwise), making appropriate simplifications, constructing a solution, and identifying the limitations of the solution. A few years after this course is over, it is likely that you will have forgotten the formula for the energy stored in a capacitor - but you hopefully will have retained these modeling skills.

We will work toward the goals expressed above throughout the course, using research-tested active learning techniques such as think-pair-share and small-group problem solving. Very little time will be used for straight lecturing!

Readings and required course materials

All course reading materials are available in LON-CAPA. The material is organized by topics over the course of the semester. For each topic, there are three stages:

1) Read the material and respond to a few questions prior to the first lecture on that chapter
2) Material will be worked on in lectures and hands-on sessions
3) Homework is due after the material has been discussed in class

The online course material establishes the expected learning outcomes for this course, and students are expected to read ALL of the material on a given subject before coming to class.

You are required to purchase an iClicker 2. The iClickers are available at the campus bookstore, among other places.
The course covers very standard physics topics. There is a plethora of material available online beyond the LON-CAPA materials, and any physics textbook printed after 1905 will do just fine.

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**Course activities**

**In-lecture activities:** The lecture component of this course will be used to clarify and elaborate upon the reading materials, rather than comprehensively cover all of the subjects discussed in the reading. To this end, we will engage in a range of activities, including think-pair-share (also known as “clicker questions”), lecture demonstrations, small group and individual problem solving, and conceptual tutorials.

**Hands-on learning sessions:** The hands-on component of this course will be used to enhance your conceptual understanding of the material and your problem-solving skills. To further these goals, you will participate in a variety of activities: physics tutorials, in-class guided problem solving, laboratory exercises, and occasionally some other activity that has intellectual utility for the course. These assignments will generally be worked on in groups of 2-4.

Programming project: You will implement a small project in VPython, related to topics in this course. A list of possible projects, as well as instructions for installing the programming language, can be found online in LON-CAPA.

**Homework:** One of the most important things that you can do to train your brain to simplify the physical world is to think through physics problems. We will assign homework in two forms: the LON-CAPA online homework system, and occasional paper-based hand-in assignments. We will regularly use the course’s LON-CAPA website (at [http://msu.lon-cap.org](http://msu.lon-cap.org)). The homework here will generally focus on one or two specific topics. The homework questions will consist of multiple-choice, essay, numerical response, and graph-oriented questions. LON-CAPA will also be used for the pre-class reading questions, which will be assigned separately. One problem per week will require a detailed solution (derivation of the solution, including graphs or figures). You can take a photo with your phone or the camera in your laptop and upload it.

**Exams:** One of the ways that we assess your learning will be by three midterm exams and a cumulative final examination. These will be composed primarily of free response questions. Exam questions will be taken from the reading materials, topics discussed during the lectures, the LON-CAPA homework, and from the work that you do during your hands-on sessions. The final exam will be held on two days in the week starting May 2nd. One will be Thursday, May 5th, 10:00am-12:00noon, and the alternative day will be decided later in the semester.

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**Grading Information**

The course grade is determined by contributions from several sources: LON-CAPA reading questions, homework, assignments in the hands-on sessions, in-lecture “clicker questions,” and exams.
Each of these contributes to the final grade in the following percentages:

- **30%** Midterm exams (3 exams, 10% each)
- **15%** Final exam
- **10%** Clicker questions
- **5%** Programming Project
- **20%** Reading Questions and Homework
- **20%** Hands-on learning sessions

The course grading scale is as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>4.0</td>
<td>≥ 92%</td>
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<tr>
<td>3.5</td>
<td>≥ 84%</td>
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<tr>
<td>3.0</td>
<td>≥ 76%</td>
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<tr>
<td>2.5</td>
<td>≥ 68%</td>
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<tr>
<td>2.0</td>
<td>≥ 60%</td>
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<tr>
<td>1.5</td>
<td>≥ 52%</td>
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<tr>
<td>1.0</td>
<td>≥ 44%</td>
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<tr>
<td>0.0</td>
<td>&lt; 44%</td>
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Please consult the LB 274 Grading Policies document (available on the course LON-CAPA page, at http://msu.lon-capa.org) for more detailed information about grading.

**Other Information**

**Class Hours:** The classroom component of this course meets three times a week, on Monday, Wednesday, and Friday in C-106 Holmes Hall. There is one lecture section, which is from 11:30 a.m. to 12:20 p.m. Please bring paper, pencil, a calculator, and your iClicker to class every day.

The hands-on sessions meet Monday through Thursday in the Lyman Briggs Physics Lab, which is E-26 Holmes Hall (in the basement of the East wing). You are expected to attend the section that you are enrolled in. If you need to change sections for a week you must contact Prof. Kortemeyer in advance, and he will work with you to find a hands-on session that fits into your schedule. Please make sure to let the LA(s) running the session know that you are there temporarily!

**Office Hours:** Office hours for Spring 2016 will be Wednesday mornings from 9-11 a.m. in Professor Kortemeyer’s Holmes Hall office (187 East Holmes), and by appointment. You are also welcome to stop by his Holmes Hall office whenever the door is open (he is usually around Holmes Wednesday and Friday mornings). Note that there will be no office hours during the week of final exams.

**Help room:** The help room is a place to get assistance with homework problems and exam preparation. It is located on the 5th floor of East Holmes Hall and is staffed by the course’s undergraduate learning assistants. Help room hours will be announced during the first week of class in lecture and via email. **Help room hours start the week of January 25th.** The help room
hours may change, depending on attendance patterns and TA/LA availability. These changes will be announced in lecture and via email.

**LON-CAPA discussion boards:** Each homework problem in LON-CAPA provides an attached discussion board. We encourage you to make extensive use of this resource. We request, however, that students do not simply post the answers to specific homework questions – while it is helpful in the short term, it is detrimental to overall learning.

**What to do if you are having difficulty in this class:** Physics can be a challenging subject to learn, and lots of people struggle to figure out how best to study. The primary reason for this is that, in physics, we take a small number of concepts and learn to apply them in a variety of ways - so, instead of having a great deal of information to retain, you must instead deeply understand a small amount of information. If you are having difficulties, we have several suggestions:

- Work in a group with at least one other person, and make sure to explain the solutions to problems to each other - explaining the material helps to solidify it in your mind!
- Consult the “How to study physics” links located in the Supplementary Materials folder on our LON-CAPA page. There are lots of useful ideas in there.
- Purchase a copy of *Schaum’s 3000 Solved Problems in Physics*, and judiciously choose practice problems from within this book. It’s often very useful to look at a problem, attempt to solve it, and then look at the provided solution afterward - solving many problems helps you to see common methods of solution, and to solidify concepts!
- Consider using resources in addition to the LB 274 materials, such as the Khan Academy lectures, the Light and Matter textbook, Hyperphysics, or most any calculus-based physics texts. Many older editions of the latter are available used for around $10!
- Hire a tutor. Many physics graduate students are interested in tutoring, and are willing to work either on a regular basis (e.g., weekly) or for an hour or two right before exams. Tutors typically cost around $15/hour for one person.
- **Above all, if you feel like you’re falling behind, please talk to Professor Kortemeyer or Alanna immediately!**

**Honors Project Information:** If you are interested in doing an Honors project, please contact Professor Kortemeyer within the first two weeks of class. We have a wide range of equipment available, including high-speed video cameras, an infrared camera, various Pasco sensors that are identical to the ones used in lab, but which plug into iPads and portable PASCO sensor platforms, as well as microcontrollers.

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**Instructor Information**

Professor Kortemeyer is in charge of all aspects of the lecture of the course, including exams and the LON-CAPA site (at http://msu.lon-capa.org). He is also responsible for the help room. Professor Benenson is in charge of the hands-on components. Alanna Pawlak is responsible for many of the logistical aspects of the course, including the grading of hands-on session material and exams. Our contact information is:
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187 East Holmes Hall  
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Department of Physics & Astronomy and Lyman Briggs College  
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Walt Benenson  
Emeritus Professor of Physics  
Lyman Briggs College  
193-A East Holmes Hall  
Email: benenson@msu.edu

**Contacting course staff:** We can be reached at the e-mail addresses found above. **Please be sure to put “LB 274“ and the nature of your query in the subject heading of the email** (for example: “LB 274: missed exam due to alien abduction, need to schedule retake”). We will respond within 48 hours.