Physics 117: Electromagnetism and Optics – Lecture/Studio Format
Fall Semester 2014

Location, Instructors, and Office Hours:

Lecture Location: Phillips 215
Regular lectures: MW 9:00-9:50 am
Midterms: Friday 9:00-9:50 am.

Lecture Instructor: Dr. Colin Wallace
Office: Phillips 162
Office Phone: (919) 962-7160
E-mail: cswphys@email.unc.edu
Office hours: W 10:00 am-12:00 pm or by appointment

Studio Session Coordinator: Dr. Jennifer Weinberg-Wolf
Office: Phillips 136
E-mail: jweinber@physics.unc.edu
Office Phone: (919) 962-0479
Office hours: F 9:00-10:00 am (in Phillips 215), M 10:00-11:00 am or by appointment

Studio Session Instructors (All sections meet in Phillips 206):
M/W 11-12:50: Tom Shafer (tshafer@physics.unc.edu) with Anthony Wu (wua2015@email.unc.edu)
M/W 1-2:50: Jonathan Heckman (jheckman@email.unc.edu) and Kyle Slinker (kslink@email.unc.edu)
M/W 3-4:50: Michael Hoffman (Michael.hoffman@unc.edu) with Vivek Chavda (chavdav@live.unc.edu)

Office hours of section instructors (to be set the first week of classes):
Vivek Chavda: M 1-2 pm (Phillips 365)
Jonathan Heckman: F 8:30-9:30 am (Phillips 242)
Michael Hoffman: MW 11-12 am (Phillips 365) and F 1-2 (Phillips 108)
Kyle Slinker: M 10-11 am (Phillips 231) and T 9-10 am (Phillips 365 – Tutorial Center)
Tom Shafer: T&R 1-2 pm (Phillips 365 – Tutorial Center) and F 10-11 am (Phillips 210)
Anthony Wu: F 1 pm (Phillips 365)

Course Description:

Physics 117 is the second semester of a calculus-based introductory physics course. Course content includes fundamental principles of electricity and magnetism: Coulomb's law, Gauss's Law, Ampere's law, Faraday's law, which together are Maxwell's equations. Their consequences include electromagnetic oscillations and waves, and their eerie behavior such as diffraction and interference. We will also talk about electrical circuits, which manipulate charge flow, and about optics, which is the manipulation of E&M waves. This particular section of the course uses an instructional format called lecture-studio. In this format, laboratory and recitation are fully integrated and synchronized to the lectures in a setting that fosters cooperative and hands-on learning. Except for exams, you will be working in small groups to complete your tasks.

Pre-requisites: Physics 116 and Mathematics 232 or permission of the instructor

Required materials:

  Note: Earlier editions of this text are acceptable.
• **MasteringPhysics** (online homework system): [http://masteringphysics.com](http://masteringphysics.com)  
  Course ID: **MPWALLACE02092**  
• i>clicker + or i>clicker2: [http://www1.iclicker.com/student-response-devices](http://www1.iclicker.com/student-response-devices) (available at the bookstore or on-line – we will not allow the use of i>clicker GO for smartphones or laptops during lecture).  
• **Scientific or graphing calculator** for exams and quizzes – *Cell phones, tablets, and any devices that can connect to the Internet or another person cannot be used as calculators and are forbidden to be visible during an exam. Students caught violating this policy should expect to receive the maximum punishment allowed by the university, including (but not limited to) receiving an F on the exam.*  
• **Laptop** for studio sections  
• **Lab book:** Quad-ruled (quadrille) notebook for labs: 8”×10”, ~90 sheets (sewn binding) (it is fine to continue using your lab book from 116 if it is less than half-filled)  

**Course Format:**

*Lecture sessions* – There will be two 50-minute lectures per week (Monday & Wednesday), consisting of demonstrations, traditional instruction, discussions, in-class voting questions, and collaborative problem-solving. Students are required to bring their iClickers to all lectures, and to finish reading assignments and warm-up exercises in advance of lecture. Lecture attendance is expected and will be tracked via responses to clicker questions. Students will have to answer all but one clicker question to get credit for lecture attendance. Students will **not** be penalized for incorrect answers during lecture. At the end of the semester, we will drop your lowest three days of attendance scores.

Carolina students have diverse backgrounds and we understand that some students have already taken similar physics classes. For the lecture section, we will use the highest of your lecture attendance (clicker) grade or average midterms and final exam grades as your lecture attendance grade. This gives you the freedom to forego lecture if you feel comfortable with the material. The instructors will make announcements during lecture that may not be posted online. If you decide to forego lecture, it is your responsibility to get the announcements for that day from a fellow student.

On Friday there will be no regular lecture, but the two midterms during the semester will be administered during this Friday hour.

*Studio sessions* – There will be two 2-hour meetings per week. Students will be divided into groups of three and almost all activities will be performed in these groups. The groups will be assigned and changed by the instructors after each midterm exam. In studio, students are expected to come to class having completed their warm-up assignments, and during class will complete hands-on activities (various labs), problem-solving activities (long recitation style questions and shorter group worksheets), and conceptual questions. Data, results, summaries and conclusions are to be recorded in your lab notebooks, and reports of various kinds will be submitted throughout the term for credit. Specific instructions will be provided for each studio section and will be posted to the resources section of Sakai (there is no separate lab manual for this course). Studio attendance is required for all students with no exceptions.

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**Course Objectives:** Students will learn to…

1. Identify the basic physical quantities of electricity, magnetism, and optics and their units;  
2. Understand the physical concepts and laws in electricity, magnetism, and optics that relate the physical quantities in the physical world;  
3. Apply the physical concepts and laws in example physics problems;  
4. Use mathematical and logical reasoning to analyze and solve example physics problems; and
5. Explain and interpret the results of solving the example physics problems and relate the calculated results to measured experimental results.

Course Expectations: Students are expected to…

1. Follow the attendance policy;
2. Adhere to the Honor Code and the Campus Code (http://studentconduct.unc.edu/students/rights-responsibilities);
3. Be prepared for class. This includes reading the appropriate text material, completing warm-up assignments **before class** (on MasteringPhysics) and completing all assignments (homeworks on MasteringPhysics as well as laboratory assignments) by their due dates; and
4. Participate actively in lecture and studio sessions.

Attendance and make-up policy:

Students who miss lecture or studio sections must fill out a form posted under the syllabus on Sakai and deliver it to the Lecturer (Dr. Wallace) or Studio Coordinator (Dr. Weinberg-Wolf) with supporting documentation. Students who submit the required documentation and are excused from lectures or studio by the instructors will not penalized. However, **there are no make-up lectures or studios or quizzes or exams**, and the student is responsible for reviewing the missed materials. Valid excuses include:
- Severe illness with doctor’s notes
- Participating in University-sanctioned events with supporting documentation.
- Travel for other classes.

**Note that pre-planned personal trips or family vacations are not valid excuses.**

Unexcused absences will result in a score of zero for any lecture attendance or studio activities of that date.

Only students with exceptional excuses will be allowed to take the Final Exam at a time different from that scheduled, and permission must be granted by an Academic Dean.

Grading:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Participation</td>
<td>5% (Warm-Up activities, Clicker questions, etc.)</td>
</tr>
<tr>
<td>Homework (Mastering Physics):</td>
<td>15% (Approximately weekly)</td>
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<tr>
<td>Midterm exams (total):</td>
<td>20% (10% for each midterm)</td>
</tr>
<tr>
<td>Studio:</td>
<td>30% (Lab activities, group worksheets, attendance, ..)</td>
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<tr>
<td>Final exam:</td>
<td>20% (the final will be cumulative)</td>
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**Grading Scale:** Grades will be based on the following scale:

- A 93-100
- A- 90-92
- B+ 87-89
- B 83-86
- B- 80-82
- C+ 77-79
- C 73-76
- C- 70-72
- D+ 67-69
- D 63-66
- F 62 and below

Grading is based on demonstrated mastery of the course objectives. We will not grade on a curve and we have no pre-defined distribution of grades we are aiming for. **You are not competing with your classmates for a limited number of As and Bs.** In principle, if everyone achieves the requirements for an A, then everyone will earn an A! However, previous experience suggests that this is unlikely, and our
department encourages instructors to aim for a median grade of B-/C+ so that about half the students in a course will likely receive grades of A or B. Consequently, the level of difficulty of the course is structured with this in mind.

Exams and Quizzes:

There will be 2 mid-term exams (with a short lab component the day before), approximately 9 quizzes, and 1 final exam for the course. The midterms will be on Friday, October 3rd, and Friday, November 7th from 9:00-9:50 am. The final exam for the class is Saturday, December 6th from 4:00-7:00 pm per the University registrar’s schedule for Common Hour Exams.

The two midterm exams will take place during the regularly scheduled class-time on Fridays. You will be tested on material from all aspects of the course. The two in-class mid-term exams will be closed-book and you will be allowed to bring a single 3"×5” note card for each midterm (and three note cards for the final exam) containing any information you wish to include. Use of calculators is permitted in all in-class exams and quizzes, and on the final exam. However, cell phone use will not be permitted. The studio before each midterm and final (Wednesday, October 1st, Wednesday, November 5th, and Wednesday, December 3rd) will include an approximately 30 minute practicum related to studio activities as part of each exam.

To encourage cooperative learning, each member of a student learning group that earns an average of 85 or better on a mid-term exam will receive a 5-point bonus on that exam.

There will be a short quiz (on MasteringPhysics) approximately weekly. You will have a 5 hour window during Friday (including our regular lecture time) during which you must complete the 20 minute quiz. The lowest quiz score will be dropped. The final exam will be cumulative.

Homework:

Homework will be assigned approximately weekly via MasteringPhysics – a web-based program designed to deliver individualized assignments and provide immediate (or nearly immediate) feedback via automatic grading. **No late homeworks will be accepted.** At the end of the semester, I will drop your lowest homework score.

"Warmups" will be approximately 15 minute multiple choice and short answer questions assignments on MasteringPhysics that are designed to check your reading comprehension of the textbook and preparation for any lab activities in studio. These are due before each lecture class (Mondays and Wednesdays at 8:00 am) and will cover material needed for both the lecture and associated studio. **No late warm-ups will be accepted.** At the end of the semester, we will drop your lowest three warm-up scores.

Reading:

There will be a reading assignment from the textbook for each lecture. You are expected to read the assigned sections of the textbook before coming to class, since all of the activities of the day will be based on the assumption that the students have read the assignment.

In Studio Work:

The “laboratory” and “recitation” portions of this course are integrated and synchronized with the lecture portion of the course. Mini-labs (tangibles) and problem-solving activities (ponderables) will be performed in nearly every studio session. Raw data, notes, and results are to be recorded in your quadrille notebook. You will submit two full individual lab reports over the semester, while the rest of the activities will have shorter write-ups – summaries, abstracts, or worksheet style questions and responses. These deliverables will be a mix of individual and group work. Conceptual questions will routinely be asked in class and responses will be polled and discussed. Your participation in studio will be graded daily – actively working with your group members on data collection and problem-solving will ensure a perfect participation credit grade.
Late Policy:

Unless you have made arrangements with the studio coordinator (Dr. Weinberg-Wolf) prior to the due date or have a university excused absence, you will lose **10 percentage points per day** on late studio assignments. Assignments more than 5 days late will not be accepted.

Instructional Philosophy:

Through this course, you will have the opportunity to analyze the physical world around you and improve your critical thinking skills. The instruction for this course places significant emphasis on qualitative physical reasoning as an important foundation to quantitative problem solving. Numerous studies conducted over multiple decades have consistently pointed to the same conclusion: No matter how eloquent or entertaining we are lecturing, you won't learn much unless your mind is actively engaged with the material. Achieving this level of active engagement is virtually impossible if all we do is lecture at you. Therefore, you should expect that there will be daily collaborative group activities during the lecture and studio portion of this class. These collaborative activities are designed to actively engage you and your classmates with the material and help prepare you for the exams. **I expect you to bring a pen or pencil, paper, and your iClicker with you to every lecture.**

Note that the instructors will act more as a "coaches" who facilitate student learning, as opposed to "lecturers" who transmit knowledge without necessarily requiring thought or action on the part of the students. Since the instructional focus is on learning rather than teaching, students are expected to take more responsibility for their own learning than might be required in a more traditional lecture format. At the same time, frequent course assignments are designed to keep students "on track" through the learning process. To the extent possible, the instruction is aimed to meet a variety of learning styles. Performing the required reading and warm-up exercises will be essential for your success in this class.

Most students who take this introductory physics course will not pursue advanced physics degrees. Consequently, you will not be required to memorize lots of physics equations, but you will be required to comprehend and apply physics concepts to a variety of situations. The reason that many students find physics difficult is that it goes beyond memorization by requiring higher level thinking skills. Learning physics is also like learning a foreign language since new words and symbols must be understood and applied correctly within the context of various physical situations. To this end, a variety of teaching techniques will be used throughout the semester. These may include – but are not limited to – Pseudo-Socratic Dialog, Peer Instruction, and Cooperative Group Problem Solving.

- **Pseudo-Socratic dialog:** Student questions are not answered directly. Instead, the teacher will ask students leading questions to facilitate the students to answer the questions themselves.
- **Peer Instruction:** Lectures consist of short presentations on key points. Students are then asked a conceptual question related to the topic at hand. They are given time to think about it and then to discuss it with their neighbors. Answers are then given and discussed as a class.
- **Cooperative Group Problem Solving:** A supportive environment is fostered in which students can practice using problem-solving strategies within the classroom setting.

Science is a group activity. Physics is done in experimental research groups and in collaborations between theorists. Working in groups will help you develop skills that will benefit you throughout life. In addition, group work will actually help you learn physics. By discussing the concepts and problems with others you will discover alternative ideas and solutions. You will also have the opportunity to teach others what you have learned. Nothing tests your understanding of an idea better than trying to explain it clearly to someone else. You are strongly encouraged to study together – or at least with other people in the class, even if they are not in your assigned group. Any work submitted individually for a grade must be your own work. Any group assignments will receive group grades. You will be assigned to three different groups during the semester (we change groups in the class after each midterm).

Honor Code:

The Honor code and the Campus Code, embodying the ideals of academic honesty, integrity and responsible citizenship, have for over 100 years governed the performance of all academic work and student conduct at the University. Acceptance by a student of enrollment in the University presupposes a commitment to the principles embodied in these codes and a respect for this significant University
tradition. Your participation in this course is with the expectation that your work will be completed in full observance of the Honor Code: http://studentconduct.unc.edu/students/rights-responsibilities

In this course, you will often be collaborating with other students, so you will be sharing data, results and ideas. However, you are encouraged to think independently before comparing results, and any written conclusions that are submitted independently and not as a group, must be in your own words.

Academic dishonesty in any form is unacceptable, because any breach in academic integrity, however small, strikes destructively at the University's life and work. If you have any questions about the Honor Code, please consult with someone in the Office of the Student Attorney General or the Office of the Dean of Students.

Class schedule:

(The instructor reserves to right to make changes to the syllabus, including assignment due dates and test dates. These changes will be announced as early as possible.) A separate daily schedule is posted on Sakai (in the syllabus tab) with additional information.