Introduction

In Physics 216 we will learn about three subjects:

- electricity
- magnetism
- light

At this point, you may think that these are three unrelated areas of study, but they are all in fact due to one thing, electric charge! Maxwell’s equations, which you will explore in this course, relate all three to electric charge, either at rest or in motion.

It is remarkable that the three subjects are really only one: Electromagnetism. This is an example of the type of scientific unification physicists most admire, and which made Maxwell a scientific hero of the first rank. And in case you have any doubts about whether this kind of scientific unification is useful, the invention of radio communication was a direct consequence of improved scientific understanding of exactly how the three subjects are unified. Our present-day hyper-connected society owes much of its existence to the work of the pioneers who uncovered the laws of electromagnetism.
While beyond the scope of this course, it is also fascinating to know that Electromagnetism was the red pill that sent physicists down the rabbit hole which quickly led to the theories of relativity and quantum mechanics, forever changing our notions of space, time, and the entire philosophy of what is knowable to an experimenter.

**The objectives of this course are:**
(1) To develop a basic understanding of the laws of electromagnetism.
(2) To develop the ability to apply these new concepts to physical situations.
(3) To develop an appreciation for the role that electromagnetism plays both in our modern society and in the universe.

**Course Details**

| Instructor          | Mitch Soderberg, Assistant Professor of Physics  
e-mail: msoderbe@syr.edu, Office #331  
Telephone: 315-443-2565  
Office Hours: Tue. 3:00-4:00pm, or by appointment. |
<table>
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<tr>
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<tbody>
<tr>
<td>Lecture Times</td>
<td>Tuesdays &amp; Thursdays, 12:30-1:50PM, Physics Building Room 106</td>
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<tr>
<td>Credits</td>
<td>3</td>
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</tbody>
</table>
| Prerequisites       | (i) PHY 215 (General Physics I for Majors)  
(ii) MAT 285 or MAT 295 (Calculus I)                                                             |
| Co-requisites       | (i) PHY 222 (General Physics II Laboratory)  
(ii) MAT 286 or MAT 296 (Calculus II)                                                            |
| Recitation          | Your recitation section will meet for 55 minutes each Wednesday and Friday, generally in room 104N of the Physics Building. |
| Getting forms signed| To add or drop this course, or to change recitation or laboratory sections, please contact Patty Whitmore  
e-mail: pawhitmo@syr.edu  
Room 111 in the Physics Bldg.                                                                      |
| Blackboard          | Course information, including assignments, announcements, and grades will be posted at Syracuse University’s blackboard website:  
http://blackboard.syr.edu                                                                 |
| Teaching Assistants | Kazage Utuje (kutuje@syr.edu)                                                                      |
| Physics clinic      | A physics clinic is operated in room 112 of the Physics Building. You can use the clinic to get help with physics problems. The clinic schedule is linked from the Physics Department website.  
The clinic is staffed by graduate students, including PHY216 recitation instructors, who do not usually have separate office hours. |
Lecture Etiquette

During lecture please refrain from talking to friends in the class, and if you must use a laptop, tablet, or phone please do so discreetly and with the device volume turned off. Your cooperation will be greatly appreciated by your instructor and your fellow classmates.

Please come to lectures prepared with any necessary textbook, calculators, pens, pencils, etc..., and complete any recommended reading material before each lecture.

Policy on E-mail

Your instructor kindly requests that when e-mailing him you include your full name somewhere in the e-mail, as well as including “Physics 216” somewhere in the subject line. I am quite happy to receive e-mail from students in the course, and will do my best to respond within a reasonable timeframe. If an e-mail requests information or action from the instructor with less than 24 hours to act (i.e. - “Help! I don’t know how to do the second problem on the homework and it’s due in an hour! #PHYSICSISHARD, LOL.”), you will very likely not get a response in time, so please plan accordingly.

Textbooks, Workbooks, and Clickers

At minimum, you need to acquire a textbook and the associated workbook for use on homework assignments and in recitation sections.


(ii) Turning Point Clicker. The lecturer will be asking “clicker questions” this semester. One can be purchased at the bookstore.

Note: Knight Vol. IV includes Chapters 25-36 of the hardcover textbook. If you already have the hardcover version from PHY215 you do not need to purchase Vol. IV.
Calendar

The Date indicated in the table is the date of the Tuesday lecture in each week. The lecture topics on this calendar may change slightly during the semester, but the quiz and exam dates are fixed. Under Topic, the number in parenthesis is the corresponding chapter in the text, which you should read before the lectures on that material.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Notes</th>
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<tbody>
<tr>
<td>1</td>
<td>1/19</td>
<td>Electric charges and electric forces (25)</td>
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<tr>
<td>2</td>
<td>1/26</td>
<td>The Electric Field (26)</td>
<td>Quiz 1: Thursday, 1/28</td>
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<tr>
<td>3</td>
<td>2/2</td>
<td>Gauss's Law (27)</td>
<td>Quiz 2: Thursday, 2/4</td>
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<td>4</td>
<td>2/9</td>
<td>Electric Potential (28)</td>
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<tr>
<td>5</td>
<td>2/16</td>
<td>Potential and Field (29)</td>
<td>Exam 1: Thursday, 2/18</td>
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<tr>
<td>6</td>
<td>2/23</td>
<td>Current and Resistance (30)</td>
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<tr>
<td>7</td>
<td>3/1</td>
<td>Fundamentals of Circuits (31)</td>
<td>Quiz 3: Thursday, 3/3</td>
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<tr>
<td>8</td>
<td>3/8</td>
<td>Fundamentals of Circuits (31)</td>
<td>Quiz 4: Thursday, 3/10</td>
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<td>9</td>
<td>3/15</td>
<td>Spring Break</td>
<td></td>
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<tr>
<td>10</td>
<td>3/22</td>
<td>The Magnetic Field (32)</td>
<td>Exam 2: Thursday, 3/24</td>
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<tr>
<td>11</td>
<td>3/29</td>
<td>The Magnetic Field (32)</td>
<td></td>
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<td>12</td>
<td>4/5</td>
<td>Electromagnetic Induction (33)</td>
<td>Quiz 5: Thursday, 4/7</td>
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<td>13</td>
<td>4/12</td>
<td>Electromagnetic Induction (33)</td>
<td></td>
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<tr>
<td>14</td>
<td>4/19</td>
<td>Electromagnetic Fields and Waves (34)</td>
<td>Exam 3: Thursday, 4/21</td>
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<tr>
<td>15</td>
<td>4/26</td>
<td>AC Circuits (35)</td>
<td></td>
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<tr>
<td>16</td>
<td>5/3</td>
<td>Review</td>
<td>Final Exam: Fri., May 6 Time: 5:15-7:15PM Location: TBA</td>
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Recitations, Homeworks, Quizzes, Exams, and Grading

Recitation and Assignment sheets

For each meeting of your recitation section there will be an assignment that includes problems for you to solve. The problems will be drawn from the textbook as well as the accompanying workbook. During the recitation section meetings, you will work on the problems in small groups with other students before presenting them to the whole section. You are responsible for reviewing all problems assigned during recitation, and they are all fair game for use on quizzes and exams. Your recitation grade will be based upon the following: your attendance and your participation in the group work on the assigned problems. At the end of the semester your lowest two recitation attendance grades (i.e. - if you miss any recitation sessions) will be dropped.

Please read the relevant textbook sections before each recitation. To help you prepare for recitation, assignment sheets with relevant textbook reading will be posted on Blackboard and the course webpage generally at the beginning of each week. Solutions to recitation problems will be posted on Blackboard after each recitation section completes.
Homework

Generally each week there will be one homework assignment which will be assigned during the Tuesday lecture and must be completed by 9am the following Tuesday. Late homework will not be accepted. No extensions will be granted, except when required by university policy. Each week’s assignment will be specified in the lecture at the beginning of the week and also posted online.

Homework solutions should be written up on paper as neatly as possible before turning in. Your instructor encourages you to work in groups on the homework if you desire to do so, but each student should write up their own solutions. Cheating on the homework (i.e. - copying another student’s work) is a violation of the university’s Academic Integrity policy, and is further not a wise idea since putting in the time to practice and master the course material on homework assignments is perhaps the best way to prepare for quizzes and exams and to succeed in the course!

Grading of the homework assignments will be handled by the TA, who will select one problem at random for each assignment and grade that problem for each student. At the end of the semester your lowest single homework grade will be dropped. Solutions to all homework problems will be posted in Blackboard shortly after the assignment is handed in.

Quizzes

There will be a 15-minute closed-book written quiz given at many Thursday lectures as indicated in the course calendar. Problems that will appear on quizzes are based on topics discussed in lecture (including explanations of demonstrations during lecture), the assigned textbook reading, and problems worked on during recitation. The quizzes will be graded by your recitation instructor and returned to you during your recitation section meeting.

Calculators are allowed during quizzes. You are responsible for bringing your own calculator. You may not share calculators during a quiz. No cell phones, tablets, or laptops are allowed during quizzes.

There are no makeup quizzes. To allow for illness or family emergencies, the lowest single quiz grade will be dropped before computing your final grade.

Examinations

Three midterm examinations and one final examination will be given in this course. The dates and times are listed on the course calendar.

The midterm examinations occupy an entire lecture period of 80 minutes. The midterm examinations are closed book. However, you may bring a single sheet (8.5×11 inches) of handwritten notes (no Xeroxes, etc.) to each examination. You can write on both sides of your sheet. Keep your note sheet for re-use on the Final Exam. Your recitation instructor will return your graded exam to you during recitation, and at that time you will have an opportunity to submit a re-grade request form should you have a concern with grading of exams.

Calculators are allowed during examinations. You are responsible for bringing your own calculator. You may not share calculators during an exam. No cell phones, tablets, or laptops are allowed during examinations.

There are no makeup midterm examinations; if you are ill, or if you have a family emergency, the examination which you miss will be dropped in computing your grade. For students who take all three examinations, the lowest of your three examinations scores will be dropped before your grade is computed.

The final examination is cumulative and covers all the material in the course. You will be allowed four (4) sheets of handwritten notes on the final examination, which is closed book.
Grading

The distribution of points used in determining your final course grade is:

- Recitation: 10%
- Homework: 10%
- Quizzes (best 4 out of 5): 15%
- Midterm Examinations (20% apiece, best 2 out of 3): 40%
- Final Examination: 25%

Your final grade in this course is not based on how well other students are doing. Every student in the course can earn an “A”. Your grade will be based on the scale listed below.

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>A</th>
<th>A-</th>
<th>B+</th>
<th>B</th>
<th>B-</th>
<th>C+</th>
<th>C</th>
<th>C-</th>
<th>D</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>100-90</td>
<td>90-85</td>
<td>85-80</td>
<td>80-75</td>
<td>75-70</td>
<td>70-65</td>
<td>65-60</td>
<td>60-55</td>
<td>55-45</td>
<td>45-0</td>
</tr>
</tbody>
</table>

Clicker Extra Credit

Your participation in clicker questions, as well as the overall fraction of correct answers you provide to these questions, will be factored into your final grade in the form of extra credit. A maximum of 2 percentage points will be added to your overall course grade based on your clicker responses (e.g. - your final grade is an 88.1%, but you earned 2% of clicker credit, boosting your score to a 90.1%). You must register (in Blackboard) your TurningPoint clicker in order to receive credit for your responses.

Laboratory

PHY 222 is the laboratory component of PHY 216, but is an independent course from PHY 216. The syllabus and schedule for PHY 222 can be found at: [http://web.physics.syr.edu/undergraduate/current-courses.html](http://web.physics.syr.edu/undergraduate/current-courses.html).
Disability Accommodation

If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), http://disabilityservices.syr.edu, located in Room 309 of 804 University Avenue, or call (315) 443-4498, TDD: (315) 443-1371 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue students with documented Disabilities Accommodation Authorization Letters, as appropriate. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

Academic Integrity

Syracuse University’s Academic Integrity Policy holds students accountable for the integrity of the work they submit. Students should be familiar with the policy and know that it is their responsibility to learn about course-specific expectations, as well as about university policy. The university policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same written work in more than one class without receiving written authorization in advance from both instructors. The presumptive penalty for a first offense by an undergraduate student is course failure, accompanied by a transcript notation indicating that the failure resulted from a violation of Academic Integrity Policy. The standard sanction for a first offense by a graduate student is suspension or expulsion.

For more information and the complete policy, see http://academicintegrity.syr.edu/academic-integrity-policy.

Religious Observance Policy

SU religious observances policy, found at http://supolicies.syr.edu/emp_ben/religious_observance.htm, recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holidays according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance provided they notify their instructors before the end of the second week of classes. For fall and spring semesters, an online notification process is available through MySlice/StudentServices/Enrollment/MyReligiousObservances from the first day of class until the end of the second week of class.