San José State University
Department of Physics and Astronomy
Physics 51: Electricity and Magnetism, Section 01, Spring 2019

Course and Contact Information

Instructor: Neil Switz
Office Location: Science 310
Telephone: 408-924-5252
Email: neil.switz@sjsu.edu (email is the best way to reach me!)
Office Hours: Tuesdays 4:30 – 5:30 and Thursdays 11:00 AM – Noon in Science 310, or by appointment.
Class Days/Time: Tuesdays and Thursdays 3:00 – 4:15 PM
Classroom: Science 253
Prerequisites: PHYS 050, MATH 031, both with grades of "C" or better
GE/SJSU Studies Category: B1+B3 (Physical Science and Lab Science; includes required Phys 51 lab)

Faculty Web Page
Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the Canvas Learning Management System course login website (accessible via MySJSU at http://my.sjsu.edu). You are responsible for regularly checking with the messaging system through Canvas to learn of any updates, assignments, or announcements.

Course Description
A calculus-based introduction to electricity and magnetism, covering electric charges, electric and magnetic fields, dc and ac circuits, and electromagnetic waves.

GE Learning Outcomes (GELO)
Upon successful completion of this course students will:
1. have exposure to essential quantitative and qualitative skills that are necessary to understand the basic application of scientific knowledge and methods.
2. have experience incorporating scientific knowledge into the workplace and everyday life experiences.
These outcomes are developed more specifically under the Course Learning Objectives, below, and are satisfied by the required problem sets, exams, and associated class laboratory component.

Course Learning Outcomes (CLO)
Upon successful completion of this course, students will be able, at an introductory level, to:
1. use critical thinking in the context of solving problems in physics
2. answer both qualitative and quantitative problems in electricity and magnetism, involving:
   a. use of algebra, vectors, and/or calculus to solve problems
   b. work with dimensionally consistent quantities, and indicate appropriate units in written work
c. use Maxwell’s equations at an introductory level

d. correctly solve problems involving the behavior of simple electrical circuits

e. demonstrate an understanding of the relationship between electric charges and current and electric and magnetic fields

3. apply their knowledge to practical, theoretical and experimental problems, and specifically to:
   a. translate information between real world problems and the mathematical relationships that describe them
   b. describe the solution to problems using clear logic and/or diagrams
   c. analyze simple experimental results and draw conclusions from them

Required Texts/Readings

Textbook

Some quizzes will be open book; you will be allowed to use your textbook during the quiz.

➤ Only physical (bound paper) textbooks will be allowed – no xeroxes or electronic access.
➤ You should buy a paper textbook.

- Official text: Young & Freedman “University Physics, Vol. 2”, ISBN 9781323171196, Custom SJSU edition for Physics 51 (this is a subset of the 14th edition of the textbook). Chapters 21 – 32; not all sections will be covered.
  o ANY University Physics textbook will be acceptable, but class will refer to Young & Freedman.
    - Homework will be provided in PDF, so you do not need to own the current edition of the textbook… consider buying used.
    - Texts by Halliday and Resnick, Serway, and Knight, as well as others, are all good.
      - Knight’s is pretty readable – “Physics for Scientists and Engineers: A Strategic Approach with Modern Physics, 4th Edition” is the current one, though any previous edition is fine.
- Pearson Mastering Physics is NOT required.
- Young & Freedman text can be obtained through the SJSU Bookstore, http://sjsu.bncollege.com; use the ‘Textbooks’ tab and enter the course details.

Other technology requirements / equipment / material

A scientific calculator may be useful in solving problems. Most people will have one, and it is recommended. Must allow use of scientific notation.

Course Requirements and Assignments

In keeping with national standards, SJSU classes are designed such that in order to be successful students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, etc. More details about student workload can be found in University Policy S12-3 at http://www.sjsu.edu/senate/docs/S12-3.pdf.

- To be successful, expect to spend 8 hours/week on the reading and homework, and more if your math or previous physics is rusty. Lab work and class time is in addition to this.

- There is usually a direct correlation between time spent on the class and final grades. More effort does not guarantee a higher grade, but low effort makes good performance unlikely.
- **You are strongly encouraged to form study groups** to discuss the homework and reading. It is especially helpful to try to explain things to each other – studies show that this is key to both you and the other students’ learning. However, do not just split up the problems so each of you does one or two of them: not only will that constitute cheating, but it will undermine your understanding and later performance on exams. All final homework submissions, solutions, and write-ups must be done individually (though you may certainly discuss it beforehand, and check your results with each other).

- The best approach to the homework (and course) is to:
  - **Read the relevant part of the chapter before class**, note where things are confusing so you can pay extra attention to that (or ask about it) in lecture.
  - **Go back and work through problems that are done in lecture, or those examples worked out in the textbook.** Note the approach / strategy used to set up and solve the problem.
    - Hint: exam problems are often drawn from such examples…
  - There are suggestions for how to succeed in Physics 51 listed at the end of this syllabus.

**Requirements and Assignments**

The course will have weekly readings and homework problem sets. Problem sets serve to reinforce the concepts in the reading, provide you practice with doing actual calculations, and model some problems that will appear on exams. Supplementary word problems will give you practice with lengthier and more context-rich (“real world”) problems, give you practice laying out your work in a context similar to a workplace, and model some of the sorts of questions likely to appear on exams. Exams serve to assess your understanding, as well as opportunities for you to review and reinforce knowledge you have gained.

⇒ Homework grade will be based on:
  - Grading of problems sets (only some will be collected / graded; grade will be determined based on a subset of assigned problems)
    - Homework is due on Thursday; it may be collected with one day’s prior notice (you are responsible for doing it every week, regardless of whether it’s collected, so additional notice is not necessary.)
  - Quizzes. Periodic in-class quizzes will be drawn directly from the assigned homework. If you can do the homework, you will be able to do the quiz.
  - “Homework” grade will be the average of the graded problem sets and the quizzes.

**Due dates:**
- Homework:
  - Weekly problem sets, when collected, will be due Thursday in-class.
  - Quizzes, when given, will also be Thursdays in class.
- Exam dates are listed below.

**Final Examination or Evaluation**

Date and time: see schedule at end of syllabus.

Additional details of examination schedule are available at [http://info.sjsu.edu/static/schedules/final-exam-schedule-fall.html](http://info.sjsu.edu/static/schedules/final-exam-schedule-fall.html), and the entirety is governed by [University Policy S06-4](http://www.sjsu.edu/senate/docs/S06-4.pdf) which states that

“There shall be an appropriate final examination or evaluation at the scheduled time in every course, unless specifically exempted by the college dean who has curricular responsibility for the course.”
Grading Information

Homework: Weekly online homework will be assigned, and (along with the Quizzes) accounts for a significant fraction of the grade. Late work will not be accepted, outside of emergencies or conditions accounted for under University policy.

Quizzes: In-class quizzes may be given on any Thursday listed in the syllabus, or with one week notice prior. Quizzes will always be on specifically assigned material – usually the homework from the past two weeks. The primary intent of quizzes is to check that you are doing the homework and reading the textbook. Many quizzes will be open book; electronic textbooks and printouts not allowed.

Lab: Each student must enroll in one section of the Physics 51 Laboratory. The lab grade will be based on your lab reports and quizzes as assigned by the lab instructor. You MUST pass the Laboratory to pass this course even though the lab grade only counts for a portion of the total course grade.

Exams: There will be three exams:

- Midterm #1, in class, (see schedule).
- Midterm #2, in class, (see schedule). The midterms are cumulative (cover all material to date in the course).
- Final (see schedule). The final exam is cumulative (covers all material from the course).

Grade disputes: Any request for re-grade of an exam must be submitted to the instructor within 7 days of receiving the graded exam.

Participation: Participation is not the same as attendance (attendance is, per university policy, University policy F15-12 (http://www.sjsu.edu/senate/docs/F15-12.pdf), not mandatory). Participation will account for 2% of the grade and be gauged by questions in class, engagement with in-class activities (including during the lab or in-class exercises), demonstration of careful preparation and/or thought about the material during office hours, and the like.

Determination of Grades

Grading will be based on a composite score weighted as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Weighted Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes &amp; Homework</td>
<td>30%</td>
</tr>
<tr>
<td>Laboratory</td>
<td>10%</td>
</tr>
<tr>
<td>Midterm #1</td>
<td>15%</td>
</tr>
<tr>
<td>Midterm #2</td>
<td>15%</td>
</tr>
<tr>
<td>Final exam</td>
<td>30%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

An alternate calculation with lower homework and higher exam weight may also be calculated for all students; in that case grades will be assigned as the best grade for each student based on either of the two systems.

The grading allocation will be:

<table>
<thead>
<tr>
<th>Final grade (A+, A, A-)</th>
<th>Curved score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90+</td>
</tr>
<tr>
<td>B</td>
<td>80+</td>
</tr>
<tr>
<td>C</td>
<td>70+</td>
</tr>
<tr>
<td>D</td>
<td>60+</td>
</tr>
<tr>
<td>F</td>
<td>below 60</td>
</tr>
</tbody>
</table>
Classroom Protocol

The intent of classroom protocol is to make the environment conducive to learning for the whole class. In many ways this boils down to respect. Beyond the student code of conduct, but in keeping with it, respect is required in class: harassment, disruption, and distracting others is not acceptable. This extends to:

- **Cell-phones:** Ringers off, stowed during class, unless used during an iClicker/polling exercise. Attendance is not mandatory; if you must be on your phone, do not come to class.

- **Computers:** stowed during class. Exception: if you are taking notes or doing an iClicker exercise. Websurfing/email is not allowed. This is simple courtesy to your fellow students: having someone websurfing in front of you is distracting. Again, class attendance is not mandatory.

- **Illness:** if you have a cold/flu, or feel that you are getting one, do not come to class. If you are clearly sick during class, you may be asked to leave. Even on an exam day, if you are truly ill please stay home. Email the faculty – before class – however, so that we know why you are absent.

- **Recordings:** Recording (audio, pictures, or video) of class, class members, or faculty and staff without permission are a violation of privacy, and not permitted. Unpermitted recording may result in your being asked to leave. Make a request and receive permission before taking pictures, etc. See the University Policies link below (pictures of the blackboard, though, are fine as long as they don’t contain people).

- **Participation:** participation is encouraged; belittling anyone for asking a legitimate question will result in negative participation score, possible removal from class, and, if conduct is egregious, referral for a Student Conduct Code violation.

- **No pets.** (Officially trained Service dogs for legally-defined disabilities are naturally fine.)

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs’ Syllabus Information web page at [http://www.sjsu.edu/gup/syllabusinfo/](http://www.sjsu.edu/gup/syllabusinfo/)

Add codes: Add codes for Physics 51 are available only from Prof. Monica Kress; if you need one, contact her by email at monika.kress@sjsu.edu.

Academic Integrity:

In addition to the University policies, available at [http://www.sjsu.edu/gup/syllabusinfo/](http://www.sjsu.edu/gup/syllabusinfo/), course policy is as follows:

- **Study groups are encouraged, and it is Ok to check homework approaches and answers with each other.**

- **All written work, and final calculations and work for the homework must be done on your own. I.e., you can work it out with colleagues, and check your answer and methods with them, but your final write-up must be your own and not copied from anyone else.**

- **All work on exams must be solely your own.**

- **To prevent any confusion, examples of things that qualify as violations are academic integrity include:**
  
  - Googling answers or other information with a smartphone during exams
  - Copying homework solutions and steps directly from an online source. (See above, “final write-up must be your own”).
  - Altering an exam, then submitting it for a re-grade

These sorts of violations are easy to spot (and to prove) and will result in an F for the course, which cannot be repeated for grade forgiveness.
Phys 51 Physics/Electricity and Magnetism, Spring 2019, TTh 3:00-4:15p

The schedule for the semester follows; it is subject to change. Any change will occur with fair (at least one week’s) notice, and such notice will be made in class and posted as an announcement on the course Canvas website. It is your responsibility to monitor this website for assignments, readings, and any other course-related information.

Course Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Approximate Topics, Readings, Assignments, Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thu, Jan 24</td>
<td>Ch 21: Charge</td>
</tr>
<tr>
<td>2</td>
<td>Tue, Jan 29</td>
<td>Ch 21: Electric field</td>
</tr>
<tr>
<td>2</td>
<td>Thu, Jan 31</td>
<td>Ch 21: Electric field</td>
</tr>
<tr>
<td>3</td>
<td>Tue, Feb 5</td>
<td>Ch 21: Electric field</td>
</tr>
<tr>
<td>3</td>
<td>Thu, Feb 7</td>
<td>Ch 22: Gauss’s law</td>
</tr>
<tr>
<td>4</td>
<td>Tue, Feb 12</td>
<td>Ch 23 Electric Potential</td>
</tr>
<tr>
<td>4</td>
<td>Thu, Feb 14</td>
<td>Ch 23: Electric Potential</td>
</tr>
<tr>
<td>5</td>
<td>Tue, Feb 19</td>
<td>Ch 23: Electric Potential</td>
</tr>
<tr>
<td>5</td>
<td>Thu, Feb 21</td>
<td>Ch 24: Capacitance</td>
</tr>
<tr>
<td>6</td>
<td>Tue, Feb 26</td>
<td>Ch 24: Capacitors</td>
</tr>
<tr>
<td>6</td>
<td>Thu, Feb 28</td>
<td>Ch 25: Current and resistance</td>
</tr>
<tr>
<td>7</td>
<td>Tue, Mar 5</td>
<td></td>
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<tr>
<td>7</td>
<td>Thu, Mar 7</td>
<td>Ch 25: Electromotive force</td>
</tr>
<tr>
<td>8</td>
<td>Tue, Mar 12</td>
<td>Ch 26: Kirchhoff’s laws</td>
</tr>
<tr>
<td>8</td>
<td>Thu, Mar 14</td>
<td>Ch 26: RC circuits</td>
</tr>
<tr>
<td>9</td>
<td>Tue, Mar 19</td>
<td>Ch 27: Magnetic fields</td>
</tr>
<tr>
<td>9</td>
<td>Thu, Mar 21</td>
<td>Ch 27: Magnetic forces</td>
</tr>
<tr>
<td>10</td>
<td>Tue, Mar 26</td>
<td>Ch 28: Sources of the magnetic field: Biot-Savart law</td>
</tr>
<tr>
<td>10</td>
<td>Thu, Mar 28</td>
<td>Ch 28: Sources of the magnetic field: Ampere’s law</td>
</tr>
<tr>
<td>11</td>
<td>Tue, Apr 2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Thu, Apr 4</td>
<td></td>
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<tr>
<td>12</td>
<td>Tue, Apr 9</td>
<td>Ch 29: Faraday’s law; Induction</td>
</tr>
<tr>
<td>12</td>
<td>Thu, Apr 11</td>
<td>Ch 29: Maxwell’s equations</td>
</tr>
<tr>
<td>13</td>
<td>Tue, Apr 16</td>
<td></td>
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<tr>
<td>13</td>
<td>Thu, Apr 18</td>
<td>Ch 30: Inductance</td>
</tr>
<tr>
<td>14</td>
<td>Tue, Apr 23</td>
<td>Ch 30: RLC circuit</td>
</tr>
<tr>
<td>Week</td>
<td>Date</td>
<td>Approximate Topics, Readings, Assignments, Deadlines</td>
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<tr>
<td>14</td>
<td>Thu, Apr 25</td>
<td>Ch 31: AC Circuits</td>
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<td></td>
<td></td>
<td>Possible Quiz</td>
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<tr>
<td>15</td>
<td>Tue, Apr 30</td>
<td>Ch 31: AC Circuits</td>
</tr>
<tr>
<td>15</td>
<td>Thu, May 2</td>
<td>Ch 31: AC Circuits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Possible Quiz</td>
</tr>
<tr>
<td>16</td>
<td>Tue, May 7</td>
<td>Ch 31: Transformers</td>
</tr>
<tr>
<td>16</td>
<td>Thu, May 9</td>
<td>Review / Catch-up</td>
</tr>
<tr>
<td>Final</td>
<td>Tue, May 21st</td>
<td>Final Exam → 2:45 – 5:00 PM ← Note different time than usual class!</td>
</tr>
</tbody>
</table>

Notes:

- Additional Quizzes are possible on any class day with one week advance notice on Canvas.
- Homework may be collected on any Thursday; if it will be collected, notice will be given at least one day in advance on Canvas.
  - You are responsible for doing and writing up your homework every week regardless of whether it’s collected, so there is no need for notice beyond one day so you bring it to class.
How to Succeed in Physics 51

Electricity and Magnetism is more mathematical, and more abstract, than mechanics (Physics 50), and that can sometimes be challenging. Here are some tips for succeeding (and enjoying!) Physics 51:

- **Read the chapter ahead of time.** Reading it after class has been proven (literally – people have done studies) to result in poorer performance.

- **Work through the equations as you read.** If you aren’t doing this, you aren’t actually reading the chapter, and it won’t help you. Seriously.

- **Don’t do all the homework at the last minute.** Yup, this too: studies show that if you work on it a bit, then get together with your study group or go to the tutoring center, then finish it, you do better.

- **Have a study group. Go to the tutoring session.** In science, working in groups and getting timely advice is literally the key to success. Same in science class.

- **Write up your answers yourself.** If you collectively solve a problem, you must still write it up by yourself. Why? Studies show that even if I do an entire problem, if then you write it down yourself (without looking at what I did) you learn it better. Plus it is required for academic integrity (Honor Code).

- **Practice.** Make up practice problems for yourself. For instance, if I ask you the weight of a drop of water, and you do the problem, then go on and calculate it for a can of coke, and a bacterium. You’ll get better doing the calculations, and learn to catch your own mistakes.

- **Do the homework.** All of it. Not doing homework and not passing are closely related.

- **Get help early!** If you are confused, don’t lose hope (and definitely don’t wait until after the midterm) – go to the COSAC tutoring center (http://www.sjzu.edu/cosac/)! They’re there to help you.

- **Follow instructions.** I usually tell people pretty much what’s going to be on the tests. Every time, people miss stuff that I promised would be there. Don’t be one of those people.

- **Show your work.** If I see what you were trying to do, I can give you credit for what you got right. Don’t leave it blank – then there is no hope for partial credit.