San José State University
Department of Physics and Astronomy
Physics 51: Electricity and Magnetism, Section 01, Spring 2018

Course and Contact Information

Instructor: Neil Switz
Office Location: Sci 310
Telephone: 408-924-5252
Email: neil.switz@sjsu.edu (email is the best way to reach me!)
Office Hours: Tuesdays 4:30 – 5:30PM; Wednesdays 1:30 – 2:30PM in Science 310, or by appointment.
Class Days/Time: Tuesdays and Thursdays 3:00 – 4:15 PM
Classroom: Sci 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

  Physics 51 (this is a subset of the 14th edition of the textbook). Chapters 21 – 32; not all sections will be
  covered.
- Also required: Mastering Physics access code for this volume of the text.
   o You will have an access code in a package in your book if you bought it new. For a used book
     you will have to purchase access to the online homework separately. Follow the instructions
     inside the package called MasteringPhysics: Student Access kit for online registration. For this
     you need:
       ▪ Your personal access code, which is beneath the pull tab inside your package.
       ▪ A valid email address.
       ▪ The general course ID, which is MPSWITZSPRING2018, and your student ID.
- 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.

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. The problems sets are due online, and 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 over several weeks.

Due dates:

- Online Homework: Weekly problem sets; due dates online. Most will be due at 11:59pm on Sundays.
- Word problems requiring written solutions, when assigned, will be due at the start of class Thursdays.
- Exam dates are listed below.

Final Examination or Evaluation

The Final Examination is on Friday, May 18th, from 2:45 – 5:00 PM in Sci 253 (the regular classroom).

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 via Mastering Physics ([www.masteringphysics.com](http://www.masteringphysics.com) instructor code MPSWITZSPRING2018), and account for 28% of the grade. Late work will not be accepted, outside of emergencies or conditions accounted for under University policy.

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 10% of the total grade here.

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 score weighted as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Weighted Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>28%</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>Participation</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

The grading allocation will be:

<table>
<thead>
<tr>
<th>Final grade</th>
<th>Curved score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A range</td>
<td>90+</td>
</tr>
<tr>
<td>B range</td>
<td>80+</td>
</tr>
<tr>
<td>C range</td>
<td>70+</td>
</tr>
<tr>
<td>D range</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.
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/

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/, course policy is as follows:

- Study groups are encouraged, and it is OK to check homework approaches and answers with each other prior to using the online system.
- All written work, and final calculations and work for the online homework, must be done on your own. I.e., you can work it out on paper, get an answer, check methods and answer with colleagues, but then must go through and do the work for the online portion on your own. Similarly, for written homework, 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, some examples of things that qualify as violations are academic integrity include
  - Googling answers or other information with a smartphone during exams
  - looking up the solutions to homework problems online and then just plugging-and-chugging in the answers without the trial-and-error that is intrinsic to learning how to solve problems.
  - 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 2018, 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>Approximately Topics, Readings, Assignments, Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thu, Jan, 25</td>
<td>Ch 21: Charge</td>
</tr>
<tr>
<td>2</td>
<td>Tue, Jan, 30</td>
<td>Ch 21: Electric field</td>
</tr>
<tr>
<td>2</td>
<td>Thu, Feb, 1</td>
<td>Ch 21: Electric field  ➤ Drop Deadline is Monday the 5th ➤</td>
</tr>
<tr>
<td>3</td>
<td>Tue, Feb, 6</td>
<td>Ch 21: Electric field</td>
</tr>
<tr>
<td>Week</td>
<td>Date</td>
<td>Approximate Topics, Readings, Assignments, Deadlines</td>
</tr>
<tr>
<td>------</td>
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<td>------------------------------------------------------</td>
</tr>
<tr>
<td>3</td>
<td>Thu, Feb, 8</td>
<td>Ch 22: Gauss’s law  ➔ Add Deadline is Monday the 12th  ➖</td>
</tr>
<tr>
<td>4</td>
<td>Tue, Feb, 13</td>
<td>Ch 23 Electric Potential</td>
</tr>
<tr>
<td>4</td>
<td>Thu, Feb, 15</td>
<td>Ch 23: Electric Potential</td>
</tr>
<tr>
<td>5</td>
<td>Tue, Feb, 20</td>
<td>Ch 23: Electric Potential</td>
</tr>
<tr>
<td>5</td>
<td>Thu, Feb, 22</td>
<td>Ch 24: Capacitance</td>
</tr>
<tr>
<td>6</td>
<td>Tue, Feb, 27</td>
<td>Ch 24: Capacitors</td>
</tr>
<tr>
<td>6</td>
<td>Thu, Mar, 1</td>
<td>Review / Catch-up</td>
</tr>
<tr>
<td>7</td>
<td>Tue, Mar, 6</td>
<td><strong>Midterm #1</strong></td>
</tr>
<tr>
<td>7</td>
<td>Thu, Mar, 8</td>
<td>Ch 25: Current and resistance</td>
</tr>
<tr>
<td>8</td>
<td>Tue, Mar, 13</td>
<td>Ch 25: Electromotive force</td>
</tr>
<tr>
<td>8</td>
<td>Thu, Mar, 15</td>
<td>Ch 26: Kirchhoff’s laws</td>
</tr>
<tr>
<td>9</td>
<td>Tue, Mar, 20</td>
<td>Ch 26: RC circuits</td>
</tr>
<tr>
<td>9</td>
<td>Thu, Mar, 22</td>
<td>Ch 27: Magnetic fields</td>
</tr>
<tr>
<td></td>
<td>Tue, Mar, 27</td>
<td>➔ Spring Break ➖</td>
</tr>
<tr>
<td></td>
<td>Thu, Mar, 29</td>
<td>➔ Spring Break ➖</td>
</tr>
<tr>
<td>10</td>
<td>Tue, Apr, 3</td>
<td>Ch 27: Magnetic forces</td>
</tr>
<tr>
<td>10</td>
<td>Thu, Apr, 5</td>
<td>Ch 28: Sources of the magnetic field: Biot-Savart law</td>
</tr>
<tr>
<td>11</td>
<td>Tue, Apr, 10</td>
<td>Ch 28: Sources of the magnetic field: Ampere’s law</td>
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<tr>
<td>11</td>
<td>Thu, Apr, 12</td>
<td>Review / Catch-up</td>
</tr>
<tr>
<td>12</td>
<td>Tue, Apr, 17</td>
<td><strong>Midterm #2</strong></td>
</tr>
<tr>
<td>12</td>
<td>Thu, Apr, 19</td>
<td>Ch 29: Faraday’s law; Induction</td>
</tr>
<tr>
<td>13</td>
<td>Tue, Apr, 24</td>
<td>Ch 29: Maxwell’s equations  ➔ Withdrawal Deadline is Wed the 25th  ➖</td>
</tr>
<tr>
<td>13</td>
<td>Thu, Apr, 26</td>
<td>Ch 30: Inductance</td>
</tr>
<tr>
<td>14</td>
<td>Tue, May, 1</td>
<td>Ch 30: RLC circuits</td>
</tr>
<tr>
<td>14</td>
<td>Thu, May, 3</td>
<td>Ch 31: AC circuits</td>
</tr>
<tr>
<td>15</td>
<td>Tue, May, 8</td>
<td>Ch 31: Transformers</td>
</tr>
<tr>
<td>15</td>
<td>Thu, May, 10</td>
<td>Review / Catch-up</td>
</tr>
<tr>
<td>16</td>
<td><strong>Fri, May, 18</strong></td>
<td>Final Exam ➔ 2:45 – 5:00 PM ➖ Note different day than usual class!</td>
</tr>
</tbody>
</table>
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.sjsu.edu/cosac/](http://www.sjsu.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.

To help you learn, physics assignments will be broken into several parts:

1. Problem sets due online. These are to help you focus on the material in the book, and practice working with it.

2. Assignments done in class (workshop time). These help you focus on concepts in a group environment.

3. Special homework “Word Problems”, for which you turn in written solutions. These are intended to give you practice with real-world types of problem solving (real world problems always start as word problems). They’re also excellent practice for exams.