

**Syllabus**  
**SCI 440U, AP Physics C**  
**Maine School of Science and Mathematics, Spring Semester 2018**

## **Class Times and Locations**

**Class** MTWF 1:30–2:25 PM,

**Lab** W 1:30–3:25 PM

All class meetings are in room B216.

## **Lecturer**

Richard Barrans, Ph.D., M.Ed.; barransr@mssm.org

Office Hours: M 11:30 AM–12:30 PM, T 5:45–6:45 PM, R 2:30–3:30 PM.

## **Objectives**

After completion of this course, the successful student will be able to:

- Explore and interpret scientific models.
- Identify and describe the physics underlying electrical and magnetic phenomena.

## **Course Content and Approach**

How does the world work? How can we find out? These questions are the basis of the science of physics. This course is the second of a two-semester sequence of calculus-based physics. It addresses electricity and magnetism, including electrostatics, conductors and circuits, capacitance and capacitors, electromagnetic induction, and Maxwell's equations. Students will analyze physical systems, construct rigorous mathematical models of the systems, and solve the models when mathematically tractable.

## **Course Materials**

**Textbook:** *Fundamentals of Physics*, Sixth Edition, by Walker, Halliday, and Resnick. Wiley, 2014.

## **Grading**

### ***Standards***

Your grade is based on satisfying performance standards. Exercises won't receive numerical scores; instead, each standard assessed receives a letter indication. Possible letters are

- I Ineligible for reassessment
- E Eligible for reassessment
- P Progressing toward satisfactory, but the standard has not been fully covered.
- S Satisfactory

The only passing indication is "S."

## Semester

Final letter grades are determined by satisfying standards and completing labs from the semester.

A+	satisfy 98% of standards and miss no more than 1 lab
A	satisfy 95% of standards and miss no more than 1 lab
A-	satisfy 93% of standards and miss no more than 1 lab
B+	satisfy 91% of standards and miss no more than 1 lab
B	satisfy 88% of standards and miss no more than 1 lab
B-	satisfy 88% of standards and miss no more than 2 labs
C+	satisfy 85% of standards and miss no more than 2 labs
C	satisfy 80% of standards and miss no more than 3 labs
C-	satisfy 75% of standards and miss no more than 4 labs

## Year

Final letter grades are determined by satisfying standards and completing labs from the entire year.

A+	satisfy 98% of standards and miss no more than 2 labs
A	satisfy 95% of standards and miss no more than 2 labs
A-	satisfy 93% of standards and miss no more than 2 labs
B+	satisfy 91% of standards and miss no more than 2 labs
B	satisfy 88% of standards and miss no more than 3 labs
B-	satisfy 88% of standards and miss no more than 4 labs
C+	satisfy 85% of standards and miss no more than 5 labs
C	satisfy 80% of standards and miss no more than 6 labs
C-	satisfy 75% of standards and miss no more than 7 labs

## Assessments

Quizzes and exams assess your performance on one or more standards. If many students do not satisfy a standard when it is assessed, it may be assessed again in a later whole-class exercise. There will also be opportunities for students to retest on standards for which their score is “E”. For an “E” rather than “I”, you must complete on time all assignments and exercises for that standard, and you must work toward fulfilling the standard in a timely manner.

## Course Components

### *Class*

Attendance is expected at all classes. Quizzes in class may not be announced beforehand, so don't miss classes.

### *Group Work*

Lectures will include work to be done in groups. This work is important to the class! Please make an effort to solve all class work problems, and to ensure that all members of your group understand each problem and solution.

## **Student Groups**

Student groups for class work are assigned. New groups will form from time to time.

## **Laboratories**

There are twelve (12) labs. Laboratory participation is an essential component of the course.

## **Groups**

It is expected that you will work in groups in lab. Many of the experiments require several people just to take the data. Groups may contain four or fewer students; obtain instructor permission *each time* for larger groups. All group members are responsible for completing all data tables, graphs, and analyses. Your instructor may check the lab sheet of any group member to evaluate the group's work.

## **Lab Reports**

Written lab reports are a key component of the course. In a report, you demonstrate your ability to organize and interpret data, to draw inferences, and to communicate conclusions. Each student must complete each lab report individually. Because the laboratory component of the course is not directly evaluated by the AP examination, students should preserve their laboratory reports for possible evaluation by college officials.

Written lab reports are due at the beginning of the next lab. Deficiencies must be corrected within one week after the graded reports are returned to the students. Repeated attempts are permitted, but each attempt must be substantive, not an attempt to get more time.

## **Lab Grades**

Labs scores are all-or-nothing. You receive credit for a lab only if your instructor approves all sections of the activity. Present your data to your instructor for approval when you leave. If any part is unsatisfactory, you may immediately fix what is wrong, or you may arrange a time to meet with your instructor *before* your next lab session to have the completed lab approved.

## **Homework, Drills, and Practice**

Homework problems will be assigned before quizzes. These are to help you learn the material and to prepare for the quizzes. They do not count toward your course grade. However, working these problems will very likely maximize your quiz scores, which do count toward your course grade.

## **Quizzes**

Once the semester is underway, weekly quizzes will assess students' mastery of the standards. Some quizzes will be administered in class; if practicable, some may be administered on-line. They must be completed in one sitting during the allotted time period. All quizzes will be open-note and open-book. Calculators are permitted. You are also permitted to access the internet during on-line quizzes.

However, any means of communication, consultation, or collaboration with any person (other than the instructor) while taking a quiz is not allowed. By way of example, and in no way

intended to limit the scope of what is considered “communication,” forbidden means of communication include speech, writing, any visible sign or symbol, vocal utterances, overheard speech, sound generated by any means, gestures including sign language, e-mail, text-messages, postings to message boards, or any other means of transferring information to another mind, whether or not known to the instructor or available at the time of publication of this syllabus. If you finish a quiz before a classmate, you may not communicate about the quiz with the classmate until they also finish.

Sharing of any materials, including textbooks, calculators, and computers, with classmates during exams is prohibited.

## **Resources**

### **Instructor**

During my listed office hours, I will be physically in my room, or I will leave a note on my desk stating where I can be found nearby (lab, main office, maker space...). You are also invited to see me in my room at other times—if the door is open, please come in.

If visiting me is inconvenient, the very best way to contact me is by e-mail. I can pretty much guarantee that I will forget any conversation in class. If I have my wits about me when you speak to me in class, I will ask you to send me an e-mail to remind me of what we discussed. If I forget, please send the e-mail anyway.

The hour immediately before a class is not a good time to contact me, because I will be concentrating on preparing for class. After class is usually better, unless I am in a hurry to tidy up before the next class.

### **Textbook**

The textbook is your first source of information. The assigned sections of the text are best read by each student before class.

### **Class web site**

Course information and other resources will be posted on the class web site at [www.barransclass.com/sci404u](http://www.barransclass.com/sci404u). Current scores for homeworks, labs, and standards will be posted on Infinite Campus. There may be resources on Canvas, if I figure it out as I go along.

### **Absences**

Quizzes missed due to an excused absence may be made up. Arrangements for make-up quizzes must be made within seven calendar days of your return to school. If you miss a quiz or make-up quiz without an excuse, you will not be allowed any further make-ups for the covered standard(s).

If you are unable to attend a lab due to an excused absence, contact me. I may either schedule a make-up at another time or pro-rate your missed lab.

## Ethical Expectations

Students are expected to respect others' opinions and abilities, and to help each other during group work, discussion, and laboratory. Those who disrupt the class or interfere with other students' opportunity to learn will be asked to leave the class. If you have a mobile phone or any other distracting equipment, turn it off or silence it and refrain from non-class use during class.

Academic honesty develops respect between faculty and students, ensures fair and effective grading, and creates an environment that fosters learning. Students are expected to work together on group work and labs, and encouraged to study together. However, all submissions must represent your OWN work.

Academic dishonesty is forbidden. Academic dishonesty primarily involves a student representing another's work as his own or assisting another student to represent another's work as his own. This includes, but is not limited to, signing an absent student's name to a sign-in sheet, submitting material for grading that is also submitted to another class, "dry-labbing" or recording data in lab that you did not actually observe, submitting material created by another without proper attribution, and receiving or giving assistance on evaluations.

You are far better off learning physics than pretending to. Physics is great fun. Any involvement in a case of academic misconduct is not.

## Disclaimer

Information in the syllabus was, to the best of the instructor's knowledge, correct when distributed at the beginning of the term. However, the instructor reserves the right to make changes in the course content or instructional techniques during the term. If any changes to the syllabus become necessary, students will be notified orally in class and by e-mail.

## Tentative Schedule

I will attempt to adhere to the following schedule, and will try to catch up if we fall behind. If we manage to get ahead, we will try to stay ahead, because the schedule is very full.

<b>Week of</b>	<b>Reading and Topics</b>	<b>Lab</b>	<b>Notes</b>
Jan 22	Ch. 21: Electric charge, electrostatics, conservation of charge.	The electrostatic force	Late Start Jan 22
Jan 29	Ch. 22: Electric field, calculating electric fields. §24.1: Potential.	Visualizing electric fields	
Feb 5	Ch. 23: Electric flux, Gauss's law.	Measuring voltage	Late Start Feb 5
Feb 12	Ch. 24: Potential, equipotential surfaces, calculating potential. §25.1: Capacitance.	Potential and field lines	
Feb 19	<b>none</b>		<b>Break</b>

Feb 26	§25.2–25.6: Combining capacitors, dielectrics. 26.1–26.3: Resistance, resistivity.	Measuring electrical quantities	
Mar 5	§26.4–26.5: Conduction model, Ohmic behavior, resistive power. §27.1–27.3: Circuits, Kirchoff's rules.	Simple circuits	
Mar 12	§27.4: RC circuits. §28.1–28.4: Magnetic fields, Lorentz force, Hall effect.	Complex circuit geometries	
Mar 19	§28.5–28.7: Particle accelerators, force on a current.	RC Circuits; time constant	Long weekend; classes resume Mar 21
Mar 26	§29.1–29.5: Biot-Savart law, calculating magnetic fields, Ampere's law.	Lorentz force, magnetic fields	
Apr 2	§30.1–30.5: Magnetic flux, Faraday's law, induction, inductance.	Electromagnets	
Apr 16	<b>none</b>		<b>Break</b>
Apr 23	§30.6–30.9: RL circuits, magnetic energy. 31.6: Transformers. §32.1–32.3: Maxwell's equations.	Electromagnetic induction	
Apr 30	§32.4–32.9: Types of magnetism. §31.1–31.5: LRC oscillators, reactance	Resonant circuits	
May 7			AP Tests
May 14	AP Physics C: Mechanics. 12:00 noon AP Physics C: Electricity and Magnetism. 2:00 PM		AP Tests
May 21			Final exam week