

**Syllabus**  
**SCI 340, Physics**  
**Maine School of Science and Mathematics, Fall and Spring Semesters 2018–2019**

## **Class Times and Locations**

Sec 1	<b>Class</b>	MTWF	8:30–9:25 AM,	<b>Lab</b>	R	8:30–10:25 AM
Sec 2	<b>Class</b>	MTWR	10:30–11:25 AM,	<b>Lab</b>	F	10:30 AM–12:25 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 mechanical, thermodynamic, wave, electromagnetic, and optical 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 a two-semester sequence of algebra-based physics. In the first semester, it addresses mechanics, waves, and thermodynamics. In the second semester, it addresses fluids, electromagnetism, optics, and nuclear physics. Students will learn to analyze physical systems, to construct mathematical models of the systems, and to solve the models when mathematically tractable. Laboratory activities, in which students can directly observe systems, gather data, and analyze authentic evidence, and draw conclusions, are a critical component of the class.

## **Course Materials**

**Textbook:** *Physics*, Sixth Edition, by Cutnell and Johnson, published by Wiley, 2004.

## **Grading**

Your grade is based on completing performance standards and laboratories.

## **Standards**

Exercises won't receive numerical scores; instead, each standard assessed receives a letter indication. Possible letters are

- F Not satisfied, no longer eligible for assessment
- E Not yet satisfied, still eligible for assessment

- P Progressing toward satisfactory, but the standard has not been fully covered.
- S Satisfactory

The only passing indicator is “S.”

## **Grades**

### **Interim grade estimates**

When it is necessary to estimate a student’s grade before the end of the semester, such as for Academic Updates, Progress Reports, or Academic Alerts,

- Standards that have not been tested are not counted.
- Standards that have been tested only once are given half weight.
- Standards that have been tested at least twice are given full weight.

A student’s percentage score is given by weighted standards satisfied divided by the total number of weighted standards tested. Grade estimates are assigned by the following scale:

- A+ satisfy 97% of standards and complete or make timely progress on all labs
- A satisfy 93% of standards and complete or make timely progress on all labs
- A– satisfy 90% of standards and complete or make timely progress on all labs
- B+ satisfy 87% of standards and complete or make timely progress on all labs
- B satisfy 83% of standards and complete or make timely progress on all labs
- B– satisfy 80% of standards and miss no more than 1 lab
- C+ satisfy 77% of standards and miss no more than 1 lab
- C satisfy 73% of standards and miss no more than 1 lab
- C– satisfy 70% of standards and miss no more than 1 lab

Students are expected to make timely progress on all labs that are not complete. Missing deadlines for resubmission is a cause for concern and will be reported accordingly.

### **Semester grades**

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 grades

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 assessment. There will also be opportunities for students to retest on standards for which their score is “E”. For an “E” rather than “F”, 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. And chances are pretty good that what I teach in class will be covered in a quiz.

### 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.

### Class Groups

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

### Laboratories

Weekly laboratory participation is an essential component of the course.

### Lab 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 data sheet of any group member to evaluate the group's work and data collection.

## Lab Reports

Written lab reports, if required, 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 a sham to get more time. Some lab reports may be submitted by an entire lab group; others must be submitted individually by each student. I will clearly communicate which is the case for each lab.

## Lab Grades

Labs scores are all-or-nothing. You receive credit for a lab only if all sections of the activity are satisfactory. 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* it is due to have the corrected part approved.

## *Homework, Drills, and Practice*

Homework problems are assigned to help you practice the material and to prepare for the quizzes. They do not count toward your course grade. However, **if you do not pass a standard when assessed the first time, you will not be allowed to test again on that standard unless you completed the corresponding homework assignment beforehand.** What's more, working the homework problems will very likely maximize your performance on quizzes, which do count toward your course grade.

## *Quizzes*

Some quizzes may be administered in class. Subject to convenience and availability, 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 quizzes and 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.

### **Internet**

Course information and other resources will be posted on the class web site at [www.barransclass.com/sci340](http://www.barransclass.com/sci340). Current scores for homeworks, labs, and standards will be posted on Infinite Campus. There may be resources on Canvas, as well.

### **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 class. 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

Week of	Reading and Topics	Lab	Notes
Aug 20	§1.1–1.4: Units. §2.1–2.2: Velocity	Graphing motion	
Aug 27	§2.3–2.8: Acceleration. §1.5–1.9: Vectors and vector addition.	Constant velocity and constant acceleration	
Sep 3	Ch. 3: 2-D kinematics. §4.1–4.2: static forces.	Projectiles	
Sep 10	§4.3–4.13: Force and acceleration; modeling selected forces	Vector addition	
Sep 17	5.1–5.4: Circular motion.	Force and acceleration	Break; classes resume Sep 19
Sep 24	Ch. 6: Work, energy, and power.	Work and energy	
Oct 1	Ch. 7: Impulse and momentum.	Collisions	
Oct 8	§8.1–8.4: Rotational kinematics.	Ballistic pendulum	
Oct 15	§8.5–8.6: Rotation + translation; Ch. 9: Rotational mechanics	Torque and angular acceleration	
Oct 22	§10.1: Hooke's law.	Rolling downhill	Break; classes resume Oct 24
Oct 29	§10.2–10.6: Simple harmonic motion.	Springs and oscillation	
Nov 5	§11.1–11.6: Fluids, pressure, and buoyancy.	Simple pendulum	
Nov 12	§11.1–11.6: Fluid flow. §12.1–12.3: temperature and temperature scales	Density and buoyancy	
Nov 19	none		<b>break</b>
Nov 26	§12.4–12.8: Heat and temperature; Ch. 13: heat transfer mechanisms;	Heat and temperature	
Dec 3	Ch. 14: Kinetic theory; §12.4–12.8:15.1–15.5: First law of thermodynamics	Entropy	
Dec 10	Final exam TBA		Final exam week

<b>Week of</b>	<b>Reading and Topics</b>	<b>Lab</b>	<b>Notes</b>
Jan 21	§15.7–15.13: Entropy, heat engine performance; §16.1–16.2: wave basics	Waves	Compressed schedule Jan 24
Jan 28	§16.3–16.9: Sound, sound intensity, decibel scale, Doppler shift	Sound	
Feb 4	Ch.17: Wave interference; §18.1–18.5: electric charge	Electrostatics	Late start Monday
Feb 11	§18.6–18.7: Electric field; §18.8: Shielding; §19.1–19.4: Electric potential; §19.5: Capacitors	Measuring voltage	
Feb 18	none		<b>break</b>
Feb 25	§20.1–20.9 Current and circuits	Electric circuits	
Mar 4	§20.10–20.11: Circuit analysis; §20.12–20.13: RC Circuits; §21.1–21.7: Currents and magnets	RC Circuits	
Mar 11	§21.9: Permanent magnets; Ch.22: Electromagnetic induction	Currents and magnets	
Mar 18	Ch 23: AC circuits, reactance, and resonant circuits	Induction	Break; classes resume Mar 20
Mar 25	Ch. 24: Electromagnetic waves; §25.1–25.5: Mirror optics	Reactance and resonant circuits	
Apr 1	§26.1–26.8: Refraction and lenses; §26.9–26.10: Compound optics	Single element optics	
Apr 8	§26.11–26.15: Optical instruments	Compound optics	
Apr 15	none		<b>Break</b>
Apr 22	Ch. 27: Interference of light	Color and diffraction	
Apr 29	Ch. 31: Nuclei and radioactivity	Radioactivity	
May 6	Ch 32: Fission and fusion	Planck's constant	
May 13	Ch.29: Particles and waves	Make ups	
May 20	Final exam TBA		Final exam week