SCI 340: Physics
Fall 2019 and Spring 2020
Maine School of Science and Mathematics

Class Times and Locations

Sec 1	**Class**	MTWF	9:25–10:15 AM,	**Lab**	R	8:30–10:15 AM
Sec 2	**Class**	MTRF	1:10–2:05 PM,	**Lab**	W	1:10–3:05 PM

All class meetings are in room B216.

Instructor

Richard Barrans, Ph.D., M.Ed.; barransr@mssm.org
Office Hours: Sun 6:30–7:30 PM; M 10:20–11:10 AM, T 2:05–3:05 PM, W 3:10–4:05 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, electricity and magnetism, 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.

Textbook

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

Grading

Your grade is based on completing performance standards and laboratories.

Standards

Standards are skills and competencies students must complete. Each standard is a segment of the course content. Standards are basically graded pass/fail: a student demonstrates mastery or not. A student does not need to master a standard on the first try to receive full credit. To try again, the student must have done the homework for the standard and must complete additional work, usually a revision. If this is completed in time, the student is eligible to test again at the next opportunity.

If you become ineligible to retest on a standard (by not doing the homework, not completing a revision on time, or not taking a quiz), you can become eligible to retest on the final exam by completing whatever you missed by the "close" date for the standard. If you simply missed a quiz, you need to submit a request to retest before the standard's close date.

Each standard receives a letter score. Possible scores are

S Satisfied
R Not yet satisfied, ready to retake at next opportunity
N Not yet satisfied, student needs to complete additional work to become eligible to retake
E Not satisfied, eligible to retest only on the final
F Not satisfied, no longer eligible for assessment

The passing score is "S."

Labs

Each lab is scored all-or-nothing: it must be satisfactory to receive credit. If a lab is not satisfactory when turned in on time, it can receive credit if it is corrected in a timely manner. Lab grades reported online are

C Complete (satisfactory; full credit)
I Incomplete (turned in on time; there is still time to correct it)
F No credit (not completed in a timely manner).

Letter 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 standards and labs. Missing deadlines is a cause for concern.

Semester grades

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

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

Course Components

Class

Attendance is expected at all classes. Quizzes in class may not be announced beforehand, so don't miss classes. Chances are pretty good that what I teach in class will be covered in a quiz.

Group Work

Classes 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.

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. Online quizzes are 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, Morse code, 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.

Quiz revisions

To become eligible to retest on a mossed standard, you usually will need to write a revision for each quiz question you got wrong for the missed standards. Revisions explain why you submitted the wrong answer and how to find the correct answer. A detailed rubric for revisions can be found online.

Homework

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, working the homework problems will very likely maximize your performance on quizzes, which do count toward your course grade. Homeworks are graded by completion: you receive full credit if you attempt every assigned problem and the homework is submitted on time. Submit homework in hard copy by its due date.

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. *There are two exceptions* per semester: Once per semester, you may retest on standards for which you did not complete the homework, and once per semester you may complete the homework between the first and second quizzes on a standard.

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 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.

Lab Reports

Written lab reports, if required, are due at the beginning of the next lab. Deficiencies must be corrected in a timely manner. Repeated attempts are permitted, but each attempt must be substantive and timely. 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.

Final Exam

The final exam is the last chance to retest on unsatisfied standards. Your final exam will assess the standards that you are eligible to retest (scores R and E).

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. Current scores for homeworks, labs, and standards will be posted on Infinite Campus. There may be quizzes 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.

Academic Integrity

2019-2020 Community Handbook

At MSSM, students and staff take great pride in academic honesty and a supportive academic environment. All are expected to maintain habits of rigorous debate, healthy inquiry, and the vigorous pursuit of truth. Academic dishonesty, in any of its forms, disrupts the learning process and tarnishes the integrity of our community. As a result, MSSM will treat instances of academic dishonesty very seriously.

If an instructor grants permission, students may collaborate in completing assignments and homework. Any unauthorized collaboration, copying, using of notes on exams/major assessments, storing of non-permitted information on calculators or on computers, or any other unacceptable activity that gives a student or a group of students advantages over others is cheating and will not be tolerated.

While the assimilation of ideas from many sources is basic to academic research and intellectual development, students must always reference the use of any non-original materials. Failure to do so is plagiarism and this dishonesty impairs an instructor's ability to accurately evaluate a student's performance. Plagiarism is using someone else's ideas, wording, or data without proper or complete acknowledgment. Credit must be given for ideas and information that belong to someone else, whether it is quoted, summarized, or paraphrased. Faculty members may require that notes, drafts, and a list of sources be submitted along with the finished project. Failure to provide evidence of the work process may constitute an admission of plagiarism.

This class

Students are expected to respect others' opinions and abilities. 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.

Students are expected to work together on group work and labs, and encouraged to study together. However, all submissions must represent your OWN work. Copying, collaborating, and sharing of materials during quizzes is not permitted, as described in detail above. Other prohibited practices include, but are 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 without clearance by both instructors, and "dry-labbing" or recording data in lab that you did not actually observe.

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

Notice of Non-Discrimination

MSSM does not discriminate on the basis of race, color, national origin, sex, disability, or age in its programs and activities. The following person has been designated to handle inquiries regarding the non-discrimination policies:

- Marie Beckum, Business Manager/Human Resource Officer/ Title IX Coordinator
- 95 High Street, Limestone, ME
- 207-554-9918

For further information on notice of non-discrimination, visit http://wdcrobcolp01.ed.gov/CFAPPS/OCR/contactus.cfm for the address and phone number of the office that serves your area, or call 1-800-421-3481

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 19	§1.1–1.4: Units. §2.1–2.3: Velocity	1. Graphing motion	
Aug 26	§2.4–2.8: Acceleration. §4.1–4.3: Force and acceleration. §4.6–4.10: Common forces.	2. Constant velocity and constant acceleration	
Sep 2	§1.5–1.9: Vectors and vector addition. Ch. 3: 2-D kinematics.	3. Vector addition	
Sep 9	§5.1–5.4: Circular motion. §4.11–4.13: Dynamics.	4. Projectiles	
Sep 16	More dynamics problems.	5. Force and acceleration	Break; classes resume Sep 18.
Sep 23	Ch. 6: Work, energy, and power.	6. Tension	Standards close Sep. 27.
Sep 30	Ch. 7: Impulse and momentum.	7. Collisions	
Oct 7	Ch. 8: Rotational kinematics.	8. Ballistic pendulum	
Oct 14	§9.1–9.5: Rotational dynamics.	9. Torque and angular acceleration	
Oct 21	§9.6–9.7: Angular momnentum.	10. Rolling downhill	Break; classes resume Oct 23. Standards close Oct 25.
Oct 28	§10.1–10.3: Hooke's law and oscillations.	11. Springs and oscillation	
Nov 4	§10.4–10.6: Pendulums, damped oscillation. §11.1–11.5: Fluids and pressure.	12. Simple pendulum	
Nov 11	§11.6–11.10: Buoyancy, fluid flow.	13. Density and buoyancy	
Nov 18	Ch. 12: Heat and temperature. Ch. 13: heat transfer mechanisms.	14. Heat and temperature	Standards close Nov. 22.
Nov 25	none		**Break**
Dec 2	Ch. 14: Kinetic theory. §15.1–15.5: First law of thermodynamics.	15. Entropy	
Dec 9	Final exam TBA		Final exam week

Week of	Reading and Topics	Lab	Notes
Jan 20	§15.7–15.13: Entropy, heat engine performance. §16.1–16.2: Wave basics.	16. Gas behavior	Compressed schedule Jan 23.
Jan 27	§16.4–16.9: Sound, sound intensity, decibel scale, Doppler shift.	17. Waves	
Feb 3	Ch. 17: Wave interference. §18.1–18.5: Electric charge	18. Sound	Late start Monday. Standards close Feb. 7.
Feb 10	§18.6–18.7: Electric field. §18.8: Shielding. §19.1–19.4: Electric potential. §19.5: Capacitors.	19. Electrostatics	
Feb 17	none		**Break**
Feb 24	§20.1–20.12: Current and circuits.	20. Electric circuits	
Mar 2	§20.13: RC Circuits. §21.1–21.6: Currents and magnetic fields.	21. RC Circuits	Standards close Mar. 6.
Mar 9	§21.7–21.9: Magnets. Ch.22: Electromagnetic induction.	22. Drift speed	
Mar 16	Ch 23: AC circuits, reactance, and resonant circuits.	23. Currents and magnets	
Mar 23	AC circuits continued.	24. Reactance and resonant circuits	Break; classes resume Mar 25.
Mar 30	Ch. 24: Electromagnetic waves. §25.1–25.5: Mirror images.	25. Light and polarization	Standards close Apr. 3.
Apr 6	§25.6: Mirror equation. §26.1–26.8: Refraction and lenses. §26.9–26.10: Compound optics. §26.11–26.15: Optical instruments	26. Ray optics	
Apr 13	Ch. 27: Interference of light	27. Light and color	
Apr 22	none		**Break**
Apr 27	Ch. 31: Nuclei and radioactivity	28. Diffraction	Standards close May 1.
May 4	Ch 32: Fission and fusion	29. Radioactivity	
May 11	Ch.29: Particles and waves	Make ups	
May 18	Final exam TBA		Final exam week