

Physics 125, Physics for Engineers II, Fall, 2020, syllabus

Brief description: Electricity, magnetism, electromagnetic waves, optics. Without lab.
Accompanying optional problem-solving session: PHYS 123. Prerequisites:

Prerequisites: PHYS 031 and MATH 022 or MATH 023; concurrent enrollment in MATH 121.

Textbook:

The same textbook as that for Phys031: e-Text version of Physics for Scientists and Engineers: A Strategic Approach, Vol. 1, 4th Edition, by Randall D. Knight. Includes access to Mastering Physics. ISBN: 9780134083148

You must have the MasteringPhysics access code for this class! You can log on to <http://www.masteringphysics.com> once you have the student access code. Our course is “MPYANG0305846” and you need to register to that course for our class.

The course is mixed, due to unprecedented Covid-19 pandemic. We have in-person lectures and these lectures are live streaming online via Microsoft Team. Students can choose freely to be in lecture or remote. The class will be completely remote after Thanksgiving Break.

Instructor: J. Yang
Innovation 221; email: jyang@uvm.edu.

Office Hour: MF: 2:10 – 3:30 PM; by Team, or by appointment.

Schedule:

Lectures: MWF, 1:10 - 2:00 PM Davis Center 401 GMB.

Lectures:

In lectures we will concentrate on concept building and problem solving. We will also work on problems to prepare for quizzes and exams.

Conceptual understanding of physics concepts.

We emphasize conceptual understanding, not detailed mathematical manipulations. In problem solving, the keys of physical understanding of class materials are to setup mathematical preparations and lay out problem solving strategies, without brutal force completion of actual mathematical manipulations and calculations.

For quite numbers of multiple-choice problems/questions, a change of a word or two of a question would result in a different answer. Therefore, it is important to understand physics and read questions very carefully.

Quizzes and exams.

All quizzes and exams are online. They will be posted on Blackboard at the time they are ready. Details later.

Quizzes are of the multiple-choice format so you can submit your answer by write submission, such as 1a, 2c, 3b and etc.

Exams will be of mixed format, with large part of the multiple-choice format. There will be a part you need to show your work, by submit an image of your work. The plan is to make an exam of two parts, the part of the multiple-choice format would allow you to submit your answer just like those in quizzes. The other part, you can work on a piece of paper and take a photo of your work and submit the photo image. No need to print the exam. Clearly label your work on paper suffices.

For submitting answers to multiple-choice question, you click on “write submission” and write something like 1a, 2c, 3b, 4e and etc.

For the work part, you submit photo image of your work by uploading onto Blackboard before click the submission button.

Note: it is possible to write complete sentences to show your work and submit those instead of uploading an image. (Answers to homework assignments are examples of these type of work showing. Answers will be posted on Blackboard after respective deadlines on MasteringPhysics site.)

Weekly quizzes:

There are weekly quizzes for most weeks, details in the course plan. These quizzes are of the multiple-choice format. These quizzes serve to consolidate your conceptual understanding of class materials.

Exams & Homework assignments.

There are three in-class exams and a final exam, all close-booked. Exams are based on homework assignments and examples in lectures. There will be an equation sheet for each exam. Blackboard (under Course Materials) will post the equation sheet in advance for your convenience.

All MasteringPhysics assignments have **deadlines**. Check MasteringPhysics course page for details. You must be diligent; do and finish each assignment before its **deadline**. Assignments will be available for you to study after the deadline. No credit for any attempt after the deadline.

There will be homework assignments not included in MasteringPhysics. They are very important for conceptual understanding of course materials and are designed to help with in-class quizzes. They will be posted on Blackboard and I will announce their posting in class well before corresponding quizzes.

No excuse for missing any exam. Any medical excuse must be cleared with the instructor.

Exam schedule: please refer to course plan.

Final exam will be all-inclusive.

The subject coverage for each in-class exam will be discussed in lectures and summarized in learning objectives (sections far below).

Reading:

You should read the materials in the textbook before the class. The lecture will be more useful if you have also attempted homework problems.

Class Grades:

- The average of all MasteringPhysics homework problems together counts 15% (counted by total problems, not by assignments).
- The average of in-class quizzes counts 12% (counted by total points, not by quizzes).
- Each in-class exam counts 18%.
- Final exam counts 20%.
- Option: swap quiz average grade with one in-class exam grade.

Anyone who misses the final exam will get the grade F for the class.

All exams and in-class quizzes are close-booked. Each exam will have an equation sheet posted on Blackboard.

Calculators are not needed in all exams and quizzes.

Exam and quiz grades will be posted on Blackboard. Grades of MasteringPhysics assignments are recorded on MasteringPhysics site.

Other: University regulations concerning academic honesty apply to all work in this course.

The course plan.

Chaps 22 – 25

- Week1, Quiz1 (Friday, 9/4, 1:45 – 2:05 PM)
- Week2, Quiz2 (Friday, 9/11, 1:45 – 2:05 PM) MP HWChaps22-23 (Saturday, 9/12)
- Week3, Quiz3 (Friday, 9/18, 1:45 – 2:05 PM) MP HWChaps24-25 (Saturday, 9/19)

Exam1, Mondat 9/21, 1:00 – 2:10 PM (Week4)

Chaps 26 – 28

- Reminder of week4, Quiz4 (Friday 9/25, 1:45 – 2:05 PM)
- Week5, Quiz5 (Friday, 10/2, 1:45 – 2:05 PM) MP HWChaps26-28 (Saturday 10/3)

Exam2 Monday 10/5, 1:00 – 2:10 PM (Week6)

Chaps 29 – 31

- Remainder of Week6, Quiz6 (Friday, 10/9, 1:45 – 2:05 PM)
- Week7, Quiz7 (Friday, 10/16, 1:45 – 2:05 PM) MP Chap29 (Saturday 10/17)
- Week8, Quiz8 (Friday, 10/23, 1:45 – 2:05 PM) MP Chap30 (Saturday 10/24)
- Week9, Quiz9 (Friday, 10/30, 1:45 – 2:05 PM) MP Chap31 (Saturday 10/31)

Exam3 Monday 11/2, 1:00 – 2:10 PM (Week10)

Chaps 33 – 34

- Remainder of Week10, Quiz10 (Friday, 11/6, 1:45 – 2:05 PM)
- Week11, Quiz11 (Friday, 11/13, 1:45 – 2:05 PM) MP Chap33 (Wednesday 11/11)
- Week12, Quiz12 (Friday, 11/20, 1:45 – 2:05 PM) MP Chap34 (Saturday 11/21)

Week13, Monday, 11/23, Last in-person lecture.

Thanksgiving Break (11/25/20 – 11/27/20)

- Week14, online lectures/reviews, Bonus Quiz (Friday, 12/4, 1:45 – 2:05 PM).

Note: materials in the Bonus Quiz are within the scope of the final exam.

Final Exam: TBD.

Homework Assignments

Chap. 22, CQ 8, 9, 11, 13, 14, 15.

Chap. 22, EP 17, 18, 20, 33, 34, 41, 43, 49, 51, 52, 63, 73.

Chap. 23, CQ 3, 6, 9, 11, 12, 13.

Chap. 23, EP 1, 2, 15, 20, 25, 38, 39, 44, 59.

Chaps22-23 assignment due: Saturday, 9/12/20.

Chap. 24, CQ 2, 3, 4, 5, 6, 7, 10.

Chap. 24, EP 5, 6, 8, 16, 19, 34, 36, 42, 43, 44, 45, 54.

Chap. 25, CQ 1, 3, 4, 7, 9, 10, 12.

Chap. 25, EP 6, 7, 27, 30, 35, 42, 43, 63, 71, 73.

Chaps24-25 assignment due: Saturday, 9/19/20.

Chap. 26, CQ 6, 9, 10, 11, 12.

Chap. 26, EP 3, 4, 9, 12, 22, 27, 28, 40, 56, 57.

Chap. 27, CQ 6, 7, 8, 9, 11.

Chap. 27, EP 24, 35, 68, 69, 74.

Chap. 28, CQ 3, 4, 5, 6, 7, 9, 11.

Chap. 28, EP 3, 4, 8, 10, 11, 19, 23, 25, 28, 30, 45, 52, 53, 55, 58, 60, 66.

Chaps26-28 assignment due: Saturday, 10/3/20.

Chap. 29, CQ 5, 6, 7, 8, 9.

Chap. 29, EP 1, 2, 12, 14, 22, 23, 27, 33, 36, 37, 43, 46, 54, 57, 59, 64. Due: Saturday, 10/17/20.

Chap. 30, CQ 1, 4, 5, 9.

Chap. 30, EP 2, 8, 9, 11, 13, 48, 59. Due: Saturday, 10/24/20.

Chap. 31, CQ 4, 8, 10.

Chap. 31, EP 6, 15, 17, 25, 30, 51, 56, 57. Due: Saturday, 10/31/20.

Chap. 33, CQ 2, 4, 5.

Chap. 33, EP 5, 12, 17, 33, 34, 36, 49. Due: Wednesday, 11/11/20.

Chap. 34, CQ 4, 7, 8, 9.

Chap. 34, EP 6, 7, 8, 16. Due: Saturday, 11/21/20.

Chap. 34, more Snell's law practice problems and lens drawing practices.

Physics125, Physics for Engineers II, Fall, 2020, course objectives.

Course logistics.

All exams and in-class quizzes are close-booked. An equation sheet will be provided for all exams on Blackboard.

Calculators are not needed in all exams and quizzes.

Exam and quiz grades will be posted on the blackboard. Grades of Mastering Physics assignments are on MasteringPhysics site.

Schedules for all quizzes and exams are on the syllabus.

In-class quizzes are to help conceptual understanding of class materials. Answers to each quiz will be on Blackboard immediately after the quiz.

Each exam will include materials in earlier quizzes.

Hints and answers to assigned homework problems will be on Blackboard immediately after MasteringPhysics deadline.

Learning objectives (specific).

Major learning objectives are closely associated to each exam. The syllabus indicates the coverage of selected chapters of the textbook before each exam. The following is a summary of course learning objectives.

Exam1, Electric forces, fields, potentials and potential energies.

- Charges.
- Coulomb's law of point charges and electrostatic forces of charged particles.
- Introduction of the electric field.
- Insulators and conductors.
- Electric flux.
- Gauss's law.
- Brief discussions of concepts of field lines and their relationships to electric fields and potentials.
- Parallel plate capacitors.
- Electric potential, electric potential energy and electric static energies of a system of charged particles.

Exam2, Capacitors and electric circuits.

- The relationship between electric field and electric potential.
- Capacitance of capacitors.
- Combo (equivalent) capacitors (in series, in parallel).
- Energies and charges stored in capacitors and their relaxation via RC circuits.
- Dielectrics.
- Understand electric current and learn names, functions and symbols of circuit elements.
- Conductivity and resistivity.
- Introduction of Ohm's law.

- Combo (equivalent) resistors (in series, in parallel).
- Circuitry basics, the junction rule and the loop rule (Kirchhoff's law).

Exam3, Magnetism.

- Static magnetic fields.
- Find magnetic fields by Ampere's law (loop line integral) and Biot-Savart's law (brutal force line integral).
- Right-hand rules to determine the direction of magnetic fields.
- Magnetic fields by long wire and long cylinder carrying currents.
- Magnetic fields by current-carrying rings and solenoids
- Magnetic forces on charged particles in motion and on wires with currents.
- Right-hand rules to find the direction of magnetic forces on charged particles and current-carrying wires.
- Magnetic fluxes.
- Electromagnetic induction. Faraday's law and Lenz's law.
- Find the direction of induced current.
- Calculate the induced current in special cases.
- Transformers.
- Magnetic inductors (L) and circuits involving inductors.
- Electromagnetic (EM) waves.

After Exam3, EM waves, wave and ray optics.

- EM waves continued.
- Polarization of light.
- Understand wave property of light.
- Understand the superposition of waves and the wave interference effect.
- Double slit interference, single slit diffraction.
- Diffraction gratings.
- Understand Ray-like property of visible light.
- The basics of reflection and refraction (Snell's Law) of visible light at flat interfaces.
- The fundamentals of the lens equation and its application in image formation.
- Brief introduction of concepts of modern physics.