*PHYSICS II (PHYS.1440)*
*Electricity and Magnetism*
*Lecture, Tu Th 8–8.50am in Olney 150*
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Welcome to the second semester of the two-semester sequence in freshman physics for science and engineering majors. Please read this guide carefully since it outlines the materials that will be covered this semester and explains what the Freshman Physics Team expects of you.

The Freshman Physics Team, including the Professors and the Tutoring Staff, wants you to be successful in this course! Expect to put in a lot of time - it's a challenging course. Talk to us if you start to get lost or are confused about a concept. It's your responsibility to come to us for help - it's our responsibility and pleasure to help!

All material, related to this course, can be found in the course Blackboard page *https://www.uml.edu/IT/Services/Academic-Technology/Learning-Management-System.aspx* and go to "Login for On-Campus Blackboard". Here you will find lecture notes, textbook information, the course policy, the homework assignments for the semester, and other information about the course and the Physics II team.

*1. Course Text, Prerequisites, and Co-requisites*

Text: The textbook for the course is "Physics for Scientists and Engineers, a Strategic Approach," Fourth Edition by Randall Knight (Pearson, 2016). The text comes either as a complete book set if you are taking three semesters of physics or a volume 2 and 1(Ch16,17) set if you are taking only one semester of physics II.

All homework will be submitted and graded primarily electronically via the Mastering Physics website *www.masteringphysics.com.* So, while the masteringphysics.com access kit is *REQUIRED* for the course, you are *NOT* required to necessarily buy the latest edition, or the exact version of the textbook offered at the bookstore. You could purchase an electronic edition, a used earlier edition, or even a different textbook entirely (although this is not recommended). Bundled packages containing the textbook (highly recommended), masteringphysics.com access kit (required) is available from the University Bookstore. *More information* on textbook bundles offered by the bookstore is available on the course Blackboard.

*Pre-requisites and Co-requisites:* All students should have successfully completed the PHYS.1410 (PHYSICS I) course at UMass Lowell or its equivalent at another institution. All students must either be currently enrolled in 92.132 CALCULUS II or have successfully completed it at UMass Lowell or its equivalent at another institution. In addition, all students must either be currently enrolled in the co-requisite laboratory course PHYS.1440L EXPERIMENTAL PHYSICS II or have successfully completed it at UMass Lowell. All equivalency determinations must be

made by the department giving the corresponding course at UMass Lowell if you were not already given transfer credit upon admission to the University. Please contact the transfer credit evaluator in the appropriate department.

2. *Course Description and Rationale, Goals and Objectives*

*Course Description and Rationale:* PHYS.1440 Physics II is the second semester of a two semester calculus based sequence for engineering and science majors. The topics which will be covered are: electricity and magnetism including Coulomb's Law, electric field, Gauss' Law, electric potential, Ohm's Law, D.C. circuits with resistors, magnetic field, current loops, Ampere's Law, Faraday's Law, inductance, Maxwell's equations, and electromagnetic waves, optics including reflection, refraction, interference, and diffraction.

*Course Goals:* The introductory physics course sequence for engineers and scientists is intended:

a) to help you to obtain a basic familiarity with the observations and experimental results on natural phenomena which occur on the scale of "ordinary sized" objects traveling at "ordinary speeds" (CLASSICAL PHYSICS);

b) to develop a working knowledge of the small number of fundamental theories which explain the diverse phenomena which occur in nature by applying them to derive the formulas which apply to particular situations using rigorous problem-solving methods.

In particular in PHYS.1440 Physics II you will develop an understanding of the phenomena of classical optics, classical electromagnetism.

*Student Learning Objectives:* The following are some examples of the specific learning objectives on which you will be tested in the homework assignments, quizzes, two one hour examinations and the final examination:

*a) To be able to demonstrate your understanding of the experiments and concepts underlying optics, electromagnetic theory by correctly answering multiple choice questions in the examinations on these topics which are presented in the textbook and lectures.*
*b) To be able to calculate the interference and diffraction maximum and minimum points on a screen due to the passage of electromagnetic waves through a single slit, pair of slits or a grating,*
*c) To be able to calculate the total force on a test charge and the electric field due to a set of charges (point or continuous) using the superposition principle for forces and fields,*
*d) To be able to calculate the total electric potential due to a set of charges (point or continuous) using the superposition principle for electric potentials,*
*e) To be able to apply Gauss' law or Ampere's law to uniform, symmetrical charge or current densities and derive the formula for the resulting electric or magnetic fields,*
*f) To be able to calculate the electromagnetic force (Lorentz force) on a test charge (stationary or moving at a constant speed) due to applied electric or magnetic fields,*

*g) To be able to calculate the acceleration, velocity, and position of a test charge as a function of time due to a constant electromagnetic force,*
*h) To be able to apply the Faraday or Ampere-extended laws to time varying magnetic or electric fluxes and derive the formulas for the resulting induced electric or magnetic fields and forces,*
*i) To be able to write the four Maxwell equations in integral form and use them to calculate the properties of electromagnetic waves.*

*3. Course Outline*[*]

| Lecture | Sections in Book | Material Description |
|---|---|---|
| L1 | Chapter 22:1-5 | ELECTRIC CHARGE |
| L2 | Chapter 23: 1-3 | ELECTRIC FIELDS |
| L3 | Chapter 23: 4-6 | ELECTRIC FIELDS |
| L4 | Chapter 24: 1-3 | GAUSS' LAW |
| L5 | Chapter 24: 4-6 | GAUSS' LAW |
| L6 | Chapter 25: 1,2,4 | ELECTRIC POTENTIAL |
| L7 | Chapter 25: 5-7 | ELECTRIC POTENTIAL |
| L8 | Chapter 26.1-3 | POTENTIAL AND FIELD |
| L9 | Chapter 26.4-6 | POTENTIAL AND FIELD |
| L11 | Chapter 28: 1-4 | DIRECT-CURRENT CIRCUITS |
| L12 | Chapter 28: 5-9 | DIRECT-CURRENT CIRCUITS |
| L13 | Chapter 29: 1-6 | MAGNETISM |
| L14 | Chapter 29: 7-9 | MAGNETISM |
| L15 | Chapter 30: 1-7 | ELECTROMAGNETIC INDUCTION |
| L16 | Chapter 30: 8-10 | ELECTROMAGNETIC INDUCTION |
| L17 | Chapter 31: 1-4 | MAXWELL'S EQUATIONS |
| L18 | Chapter 31: 5-6 | MAXWELL'S EQUATIONS |
| RECIT | Chapter 16 | TRAVELING WAVES |
| RECIT | Chapter 17 | SUPERPOSITION |
| L19 | Chapter 33:1-3 | WAVE OPTICS |
| L20 | Chapter 33: 4-5 | WAVE OPTICS |
| L21 | Chapter 34: 1-3 | RAY OPTICS |
| L22 | Chapter 34: 4-6 | RAY OPTICS |
| L23 | Chapter 34: 7,8 | RAY OPTICS |

*4. Course Format - Lecture, Recitation*

The lectures will cover new material and the recitation classes will be used to discuss the lecture material, work out sample problems, and administer weekly quizzes. Keep all course material in a folder or binder in an organized fashion. Organization is a major key to success in this course.

*5. Examinations and Examination Schedule*

*The common exams for all sections will be given during lecture times on the dates given below.* In addition, there will be a 3 hr final examination during finals week.

[*] May be modified as Semester unfolds

*Exam Schedule- Fall 2022*[**]

| Date | Exam | Material Covered |
|---|---|---|
| *October 6* | *Exam 1* | *Chapters 22 – 26* |
| *November 3* | *Exam 2* | *Chapters 27 - 29* |
| *TBA* | *Final* | *All covered Chapters (exclusions will be announced)* |

For each exam session, you must bring pencils, erasers, and a calculator. Only ordinary calculators are allowed. Alphanumeric calculators (those that include written formulas in their display modes) are NOT permitted. All formulae needed for an exam are provided on sheets attached to the exam.
You must show sufficient work in your solution. For each problem, a grader will verify that:
1) There is an explanation of the problem's solution.
2) The solution presented is reasonable, i.e., essentially correct as shown.
3) There is sufficient detail in the explanation to allow someone to understand all the steps of the solution.
If these conditions are not met, then you will receive reduced or no credit for the problem.

If a student misses an exam, they must contact an instructor within 24 hours after the exam. Illness on the day of a major examination must be verified by submission of a letter from a physician or nurse showing that you were seen prior to or on the day of the examination and attest that your illness made you unable to take the examination. Any other unusual situation needs your recitation instructor's approval in writing. All other absences, i.e. varsity sports, family weddings etc., must be made one week in advance by written request and approved by your instructor. Only one approved major examination absence is allowed.

*6. Homework Assignments:*

Regular homework assignments will be done online at *www.masteringphysics.com*,

*course name: PHYS1440F22*
*course ID: danylov87549*

*The registration to Mastering Physics MUST be done through our Physics II Blackboard.* Go to a Homework folder and click on any link inside. You will be guided through the registration procedure. These will be one online homework per week (usually every Sunday at 11.59 pm) and will focus on the material covered in that week. For these, you will be allowed 6 attempts to input the correct answer. Your total HW grade will be reduced 25% for each day past (1% per hour) the due date that the HW is submitted. You should be able to see your ONLINE HW scores as soon as you finish the HW set.
You have to do many more than just the assigned homework problems to learn the material in the course. Problem solving skills is one of the most important learning goals of this course. One of the best ways to do homework is to form small groups and work the problems together. Remember, the *Mastering Physics* software

[**] The Schedule may change as a result of changes in the University Schedule.

randomizes the variables for each problem, so everyone will have different answers for each problem. However, the way you solve the problems will be similar, and this can be worked out in groups. Assigning one or two problems to each member in the group is NOT an effective way of doing homework! In order to do well in this course, you must have a good understanding of the homework, so if you work in a group, make sure you understand how to do each problem!
Working on Physics as a team will improve your grade.

*7. Quiz Policy*

There will be at least one quiz per chapter, which will be announced. They will typically cover recent material and be similar to the homework problems. Unexcused absences for a quiz will result in a grade of "0" for that quiz.

*8. Cancellation Due to Closing of University*

If the University closes due to a snow emergency, we will pick up where we left off. At the next lecture a revised schedule will be posted to work around the lost day. If the closing causes a cancellation of an exam, the exam will be rescheduled, and the revised date announced during the first lecture scheduled after the cancelled day.

*9. Attendance/Absence and Disabilities Policies*

Attendance is required in all lectures and will be checked using Poll Everywhere app. Conceptual questions will be asked during our Physics II lectures and your responses will be recorded using "Poll Everywhere" app. Your responses (correct or wrong) will be used to check your lecture attendance.

If you have either a *learning disability or severe physical handicap* you may be eligible for extra time during exams and the final. Discuss your situation with the UMass-Lowell Counseling Center (978) 934-4331. A properly filled out *Learning Disability Accommodation Notification* form must be filled out and a copy given to your recitation and lecture instructor in order for us to accommodate your needs. All information will be kept confidential.

*10. How Your Grade is Determined*

Your letter grade is based on the total points you earn, as follows:

| | |
|---|---|
| Homework | 15% |
| Quizzes | 15% |
| Exam 1 | 15% |
| Exam 2 | 15% |
| Final | 30% |
| Lecture Attendance | 10% |
| *Total* | 100% |

The following table provides the cutoffs that were used in the previous few semesters and is most likely to be continued this semester.

*Grade Conversion Table*

| | |
|---|---|
| A | 90% - 100% |
| A- | 85% - 90% |
| B+ | 79% - 85% |
| B | 73% - 79% |
| B- | 66% - 73% |
| C+ | 59% - 66% |
| C | 51% - 59% |
| C- | 45% - 51% |
| D+ | 40% - 45% |
| D | 35% - 40% |
| F | 0% - 35% |

Note: An *unexcused* absence from an Exam will result in a "0" for the exam. An unexcused absence on the final will result in a course grade of "F".

*11. Help if You Have a Problem*

*If you have a problem, your recitation instructor is the first person you should contact.* For help on the course work, arrange a meeting with your recitation instructor or one of the tutoring centers. The instructors will provide you with their specific office hours. They will also see you by appointment at mutually convenient times if you can't make office hours. For major unresolved problems contact *A. Danylov (contact info at the top of this document).*

*12. Academic Conduct and Integrity*

You are responsible for proper academic conduct - please refer to the university's academic integrity policy at the following URL:
http://www.uml.edu/catalog/undergraduate/policies/academic_dishonesty.htm
The basic rule of thumb is simple: you should not try to receive credit for work you have not performed. This means, e.g., that you must do your own homework assignments and take your own exams and quizzes. If you are struggling in the course, meet with your recitation instructor to figure out how we can best help you. There are no easy (ethical or otherwise) ways to pass this course, but we are dedicated to ensure you have the best support possible to succeed.