

PHYS273
Fundamentals of Physics II:
Electromagnetism

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CATALOGUE DESCRIPTION

Course Summary: Physical laws governing electricity and magnetism using calculus. Primarily for majors in the physical and mathematical sciences and engineering. One three-hour laboratory a week.

Not available for credit to students with credit in PHYS 211, PHYS 251, or PHYS 251A.

Prerequisites: PRQ: PHYS 250A or PHYS 253, CRQ: MATH 230

INSTRUCTORS

Michel van Veenendaal
LaTourette Hall, room 223
e-mail: veenendaal@niu.edu, The best way to reach me is via e-mail.

CLASS MEETINGS & OFFICE HOURS

The class is online. Official class hours are Tu and Th from 12.30 to 1.45pm. Due to the size of the class, lectures will be recorded and posted before the meeting time.

The tests will be in person in the Carl Sandburg auditorium. See the exam schedule or MyNIU for dates.

For meetings, please e-mail me to set up a time for an online meeting.

COURSE DESCRIPTION & OUTCOME

This course enables students to learn about the electrical and magnetic properties of matter in terms of basic laws of nature. Students will develop problem-solving techniques and acquire skills to describe physical situations using mathematical descriptions to solve problems. The lectures incorporate discussion/solving sessions and experimental demonstrations. The PHYS273 class is supplemented by lab sessions that provides students opportunities to develop experimental skills, learn how to use basic laboratory equipment, and gain experience with redacting scientific reports summarizing their experiments. Students completing this course are expected to develop essential foundations in physical concepts that will prepare them for upper level courses in Science and Engineering.

TEXTBOOK

The textbook is

Physics for Scientists and Engineers: Foundations and Connections, Extended Version with Modern Physics , 1st Edition by Debora M. Katz
ISBN-10: 1-305-25983-1 ISBN-13: 978-1-305-25983-6

An alternative textbook is:

Physics for Scientist & Engineers Volume 2, Fourth Edition, by
Douglas Giancoli. ISBN-13: 978-0-13-149508-1 ISBN: 0-13-149508-9, published year:
2009 by Person Education, Inc, Person Prentice Hall.

PREREQUISITES

The official prerequisites are given in the catalogue description. Typical mathematical methods that will be used are

- Working with symbols. Many derivations will be done using symbols as opposed to inserting numbers early on.
- Vector addition in two and three dimensions.
- Trigonometry in particular in relation to vector projection.
- Calculus (integration, differentiation, setting up integrals in cartesian, spherical and cylindrical coordinates).
- Simple differential equations (say, Newton's law).
- Concepts from classical mechanics, such as Newton's equation of motion, conservation of energy, potential energy, work, etc.

ASSESSMENT & GRADING

The assessment will consist of homeworks, three tests, and a final. The grading will be as follows:

Homework 10% of overall grade (only if lab. grade $\geq 60\%$)

Exams 40% of overall grade (each exam counts for 10%)

Labs 25% of overall grade

Final exam 25% of overall grade

Note: adjustments in the weighting can be made according to changes in exams and the homeworks assigned. The total in blackboard gives the total points out of 100 (for 252 students, the total points is 75, which will be rescaled to 100).

Students taking PHYS252 will have their grades assigned given the following weights: Homework: 13.33%, Exams: 53.33%, Final exam: 33.33%.

The numeric averaged grade will be computed given the above Table and a letter grade will be assigned following the table below.

Letter grade Percentage points.

A \geq 92%
A⁻ \geq 85%
B⁺ \geq 80%
B \geq 75%
B⁻ \geq 69%
C⁺ \geq 62%
C \geq 55%
D \geq 50%
F < 50%

A minimum average lab grade of 60% is required. You will **fail** the course if your lab score is below this mark.

It is likely that the scales will be adjusted downwards (curved).

Further information on NIU grading system can be found at:

<http://www.niu.edu/regrec/grading/gradingfaqs.shtml>

There will be no make-up tests. Tests cannot be taken at times other than the class test time.

Only basic calculators can be used during tests. No other electronic devices are allowed.

HOMEWORK

The homework sets will be available on blackboard.

LABS & LAB REPORTS (PHYS273 ONLY)

The lab syllabus is provided separately and will be discussed in your lab section by your respective TA during the first lab session. During the laboratory experiments you will be working in small groups to perform the relevant experiments and acquire the associated data. Subsequent to the laboratory session, each student is expected to analyze alone the acquired data, performed the relevant analysis, and redact his/her own report. The team work should be limited to performing the experiment and acquiring the data only. Each student is expected to write an individual formal report due within a week after the lab session took place.

For TA information, see the lab syllabus.

BLACKBOARD

All information on the course and the labs will be posted on blackboard. Everything will be posted under “Content” and there is no need to look under different Sections.

During class, the digital projector is used and the notes written during class are posted on blackboard.

Again, to keep things simple, all graded work is treated as tests on blackboard. Therefore, homework is a mini test worth one point out of a hundred. There is no limitation on the number of attempts for the homework, but no attempts can be taken after the due date. The due date and other information on the test becomes visible when clicking on the test (this does not yet start the test).

STUDENT RESPONSIBILITIES

The students are expected to be engaged learners, to attend the lectures, laboratory session, and participate in the problem solving and/or assist the instructor in experimental demos. Plagiarism and cheating are serious academic offenses and offenders will be directly referred to the University's judicial office.

ACCESSIBILITY

If you need an accommodation for this class, please contact the Disability Resource Center (RDC) as soon as possible. The DRC coordinates accommodations for students with disabilities. It is located on the 4th floor of the Health Services Building, and can be reached at 815-753-1303 (V) or drc@niu.edu. Also, please contact me privately as soon as possible so we can discuss your accommodations. The sooner you let us know your needs, the sooner we can assist you in achieving your learning goals in this course.

A word about anxiety

These are extremely stressful times. You are not alone in feeling it. We are all living with unsettling uncertainty and it affects the way we perceive the world, ourselves and others. Such feelings may be persistent or may come on suddenly. Let's all promise to be patient with each other and help support a healthy learning environment. If you or somebody you know is struggling with anxiety or other issues, do not hesitate to reach out. Resources available include the DRC, Student Counseling Services or call 815-306-2777. As always, in the event of a crisis call for immediate help via 911 or other general support services listed here.

SYLLABUS

The (approximate) lesson plan is as follows:

- Lesson 1: General introduction. Electrostatic: static electricity, electric charges. Coulomb's law, electric fields.
- Lesson 2: Coulomb forces, electric field, continued.
- Lesson 3: Coulomb forces, electric field, continued.
- Lesson 4: Electric flux & Gauss's law.
- Lesson 5: Electric flux & Gauss's law, continued.
- Lesson 6: Electric potentials.
- Lesson 7: Electric potentials, continued.

- Lesson 8: Capacitors.
- Lesson 9: Capacitors, continued.
- Lesson 10: Ohm's law.
- Lesson 11: Ohm's law, continued.
- Lesson 12: DC circuits
- Lesson 13: DC circuits, continued.
- Lesson 13: Magnetic fields.
- Lesson 14: Magnetic fields, continued.
- Lesson 15: Sources of magnetic fields.
- Lesson 16: Sources of magnetic fields.
- Lesson 17: Induction.
- Lesson 18: Induction, continued.
- Lesson 19: AC circuits.
- Lesson 20: AC circuits, continued.
- Lesson 21: Maxwell's equations.
- Lesson 22: Maxwell's equations, continued.

Note the lesson plan is approximate and does not follow the classes exactly. Some subjects might take longer, time is needed for in-class tests, reviews, etc.

IMPORTANT NOTES ON PLAGIARISM

As indicated in the "LABS and LAB REPORTS" section, no form of plagiarism will be tolerated in this class.