PHYS273/252:
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

INSTRUCTOR

Philippe Piot, Prof. of Physics
LaTourette Hall, room 226
Tel: 815 753 6473
e-mail: ppiot@niu.edu, The best way to reach me is via e-mail. **(Please use sensible e-mail subject-headings starting with PHYS273 or PHYS252)**

CLASS MEETINGS & OFFICE HOURS

This class meets on Tuesdays and Thursdays from 9:30pm to 10:45pm in Faraday Hall, Montgomery Auditorium (to be confimed).
I am available to answer your questions or discuss matter related to this course anytime from 11:00pm to 1:30pm on Tuesdays and Thursdays. For other times and/or days please send me an e-mail to schedule a 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 an opportunities to develop experimental skills, learn how to use basic laboratory

equipments, 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 required 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.

TOP HAT

We will be using the TopHat (www.tophat.com) classroom response system in class. The system will be used to take attendance, post and grade homework, and post note relevant to lecture and labs. TopHat will be enable you to submit answers to in-class questions using Apple or Android smartphones and tablets, laptops, or through text message.

You can visit the TopHat Overview (https://success.tophat.com/s/article/Student-Top-Hat-Overview-and-Getting-Started-Guide) within the TopHat Success Center which outlines how you will register for a TopHat account, as well as providing a brief overview to get you up and running on the system.

An email invitation will be sent to you by email, but if do not receive this email, you can register by simply visiting our course website:

Unique Course URL https://app.tophat.com/e/013527
Note: our Course Join Code is **013527**

Top Hat will require a paid subscription, and a full breakdown of all subscription options available can be found here: www.tophat.com/pricing.

Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email (support@tophat.com), the in app support button, or by calling 1-888-663-5491.

ASSESSMENT & GRADING

The assessment will consist of weekly homework, three exam, and a final exam (on Wed. May 11, 8-9:50 a.m). The grading will be as follows:

Homework	10% of overall grade (only if lab. grade $\geq$ 60%)
Exams	45% of overall grade (each exam count for 15%)
Labs	25% of overall grade
Final exam	20% of overall grade

Students taking **PHYS252** will have their grades assigned given the following weights: Homework: 15%, Exams: 55%, Final exam: 30%.

The numeric averaged grade will be computed given the above Table and a letter grade will be assigned following the table below. The scale might be shifted in the direction that improves grades.

Letter grade	Percentage points.
A	$\geq 85\%$
A-	$\geq 80\%$
B+	$\geq 75\%$
B	$\geq 70\%$
B-	$\geq 65\%$
C+	$\geq 60\%$
C	$\geq 55\%$
D	$\geq 50\%$
F	$< 50\%$

Further information on NIU grading system can be found at:
http://www.niu.edu/regrec/grading/gradingfaqs.shtml

HOMEWORK

The homework problems will be taken from the textbook and the homework sets will be available on the `tophat` platform. You will need to purchase a license (see info below). The homework grade will generally be provided within 10 business days of the due date. I also encourage you to come to my office to discuss your results and errors.

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. The report should be submitted via the blackboard system in a word (.docx) or pdf (.pdf) files as instructed by your Teach Assistant. If you choose to submit a pdf file, it should be generated with the text-processing software you used **and not generated from a scan of a printed version** (scanned pdf files will not be accepted and the report will be considered as not returned). For your information the labs are automatically checked for plagiarism and originality. Laboratory with similar content will not be graded and all offenders will be directly referred to the University's judicial

office.. The TA e-mails are below. When writing to them ensure you have a sensible subject line and expect an answer within two business days at the latest.

Sections	Instructor	e-mail
A/AH, G	Mr. Matt Urfer	murfer1@niu.edu
B	Ms. Christina Sariosek	csarosiek1@niu.edu
C, F	Mr. Jacob (Jake) Colson	jcolston1@niu.edu
D/DH, E	Mr. William Baker	wbaker5@niu.edu

The lab are held in room 105 located in the basement of Faraday Hall.

A minimum average lab grade of 60% is required to pass the course.

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. Attendance will be monitored randomly and be taken into account when devising final grades.

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.

SYLLABUS

The lesson plan is as follows (one lesson corresponds approximately to one 1hr15-min class (there are 31 class meetings and 3 will be used for in-class exams).

- Lesson 1: general introduction, maths basis, some reminders of PHYS253 - **I Electrostatic:** static electricity, electric charges, Coulomb's law
- Lesson 2: Electric field - field lines-
- Lesson 3: electric dipoles - some applications
- Lesson 4: electric flux & Gauss's law -
- Lesson 5: application of Gauss's law
- Lesson 6: Electric potential and potential difference
- Lesson 7: Potential due to point charge & continuous charge distributions

- Lesson 8: Equipotential surface - Electric-dipole potential
- Lesson 9: relation between E-field and potential - applications: cathode-ray tubes
- Lesson 10: capacitor & capacitance - electric-energy storage
- Lesson 11: dielectrics
- Lesson 12: Electric current - Ohm's law - resistivity - electric power
- Lesson 13: microscopic view of electric current - superconductivity
- Lesson 14: EMF - Kirchoff's rules - resistors in series and parallel, series and parallel EMF
- Lesson 15: *RC* circuits
- Lesson 16: **II magnetism:** magnet & magnetic fields, magnetic field from electric currents
- Lesson 17: the B field - motion of charged particle in a magnetic field
- Lesson 18: magnetic dipole moment - the Hall effects - applications: mass spectrometers
- Lesson 19: Source of magnetic field
- Lesson 20, 04/07: Ampère law – Biot & Savart law
- Lesson 21: magnetic materials - electromagnets
- Lesson 22: **III electromagnetism**: Induced EMF, Faraday's law of induction
- Lesson 23: Varying magnetic field and electric field
- Lesson 24: Mutual inductance self inductance – energy stored in magnetic field
- Lesson 25 LR, LC, and LRC circuits - impedance matching
- Lesson 26: Maxwell's equations I
- Lesson 27: Maxwell's equations II

IMPORTANT NOTES ON PLAGIARISM

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