

VILLANOVA UNIVERSITY
DEPARTMENT OF PHYSICS

Syllabus

Physics: 4003-01

Electricity and Magnetism Lab II

Spring 2014

INSTRUCTOR: Dr. John K. Vassiliou,
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OFFICE HOURS:

Monday, Wednesday & Thursday Friday 12:30-1:30. You can talk to me any time you want. If I am not in office, leave a message in my mail box or with the physics department office or send me an e-mail message.

CLASS STRUCTURE AND OBJECTIVES:

The purpose of this experimental course is to complement the Electricity and Magnetism course Physics-4002 where the basic theoretical ideas of Electromagnetism are introduced and described using Maxwell's equations. *The course satisfies the writing enriched requirements.* The experiments studied here will introduce methods and ideas that become standard tools of experimental physics or gave rise to new technologies. Emphasis will be given to the logic and methodology of the experiments as it is applied in a realistic scientific thinking. The use of computer as an experimental tool in collecting and analyzing data will be a necessity. Familiarity with soft wares such as *SigmaPlot* and *Microsoft-Excel* is assumed. If more formal mathematical manipulations are needed the software *Mathematica* by *Wolfram* will be used.

We will have ten (10) mandatory experiments. The experimental set up, the performance of the experiment and the analysis of the data will be done under the close supervision of the instructor.

REPORTS:

You are expected to submit a four to five page report *for each experiment* a week after you took the data. The report will be written in the same format as a paper publishable in a research journal. The report will be corrected and judged for content, style and language and is expected to satisfy the writing enriched requirements. If the requirements are not satisfied the report will be returned for further corrections and resubmission. If the time is not enough to finish the lab during the assigned time, feel free to continue the experiment any time during the week. Cooperation is encouraged but plagiarism is not tolerated.

GRADING:

Your grade will be based on your lab reports (80%) and the instructor's judgment concerning your lab performance and preparation (20%). Lab reports submitted later than the one week allotment time, will incur a 10% reduction in grade for each additional week of delay. The student is expected to be aware of the theoretical and experimental ideas involved. The instructor will orally quiz the students about their lab preparation and a grade will be assigned, which will

contribute to the lab report grade.

Experiments in operation:

Transmission Lines

Application of Fresnel Equations: Dielectric Cylinder

Rotation of the Polarization of Light in a Magnetic field (Faraday Rotation)

Zeeman Effect

Microwave Waveguides

Microwave Spectrometer

Propagation of Electromagnetic Waves Beyond the Critical Angle

Polarization of Scattered Electromagnetic Waves

Scattering of Electromagnetic Waves by Particles

Interference Patterns from Multiple Slits, Holes and Grids

If any of the above experiments fails it will be substituted by any of the following experiments:

Propagation and Interference of EM waves in Dielectric Materials.

Pulsed Nuclear Magnetic Resonance (NMR) experiment: measurements the T_1 and T_2 time constants.

Slipping of a Rolling Sphere.

The above is a tentative schedule. Gradual changes during the semester are expected in order to accommodate new material or upgrade old one.