

Extended Syllabus

Course Title	Electromagnetism 1	Semester	2022, Spring
Credit	3	Course Number	PHY2003
Class Time	Tue. Thu. 13:30~14:45	Enrollment Eligibility	Sophomore in physics major

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I. Course Overview

1. Description

학교방침은 40인 이상이면 비대면 강의로 진행하도록 되어 있으나 일단 대면으로 신청하고 상황을 지켜볼 예정입니다. 학교의 지침에 따라 이번 학기는 상대평가로 평가합니다. (영어강의는 상대평가 예외 조항으로 되어 있으나 일단은 상대평가로 진행). 모든 시험은 가능하면 대면으로 진행할 예정입니다. 그러나 추후 상황이 유동적이니만큼 변동 여지가 있음을 양해해주시 바랍니다.

We study the electrostatics and the magnetostatics in vacuum and in matter based on the mathematical approach of vector calculus and differential equations.

2. Prerequisites

(1) General Physics I and II.

(2) Calculus and matrix algebra at the level of freshman courses.

(3) You should be familiar with Taylor expansions, partial derivatives, and various integration techniques.

3. Course Format (%)

Lecture	Discussion	Experiment /Practicum	Field study	Presentations	Other
100%	%	%	%	%	%

4. Evaluation (%)

Mid-term Exam	Final exam	Quizzes	Presentations	Projects	Assignments	Participation	Other
30%	40%	30%	%	%			%

II. Course Objectives

Knowledge: A thorough understanding of static electric and magnetic fields in vacuum and matter.

Skill: In this course you are expected to become acquainted with the vector analysis and certain types of partial differential equations.

Attitude: From the physics point of view, many topics should be familiar on. Now we put them on solid mathematical foundations, aiming at the complete formulation of Maxwell equations.

III. Course Format

(* In detail)

- (1) A recitation session will be held in every other week (the schedule will be notified later), and you are expected to attend it on a regular basis.
- (2) An assignment will be posted in Cyber-Campus (approximately) in every 1 and 1/2 weeks, which typically consists of 7~10 problems from the main text or supplementary readings.
- (3) The instructor will provide model solutions and the problem set will be discussed in discussion session.

IV. Course Requirements and Grading Criteria

- (1) Quiz is equivalent to a second midterm examination, which is likely to be held sometime in May.
- (2) The first midterm and the final examinations will be held in regular examination period.

The instructor will post the model solution immediately after each examination and will accept the complains about the graded exam papers for a certain period. The grading guide (or criteria) will be also posted in Cyber-Campus for the ease of assessment of your graded result.

V. Course Policies

- (1) You are expected to comply with the standard mobile phone etiquette.
- (2) Cheating will be severely punished in accordance with the college regulations.

VI. Materials and References

Main text

David J. Griffiths

"Introduction to Electrodynamics" (4th Edition, Cambridge University Press).

(Other editions are acceptable, too)

ISBN-13: 978-1108420419

A standard text for the electrodynamics at the undergraduate level.

Supplementary Reading

Feynman Lectures on Physics Volume 1 and 2. Freely available online

<http://www.feynmanlectures.caltech.edu/>

VII. Course Schedule

(* Subject to change)

Week 1 (03/03)	Learning Objectives	Understanding of vector analysis
	Topics	Vector algebra and differential calculus
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 1 of the main text
	Assignments	To be posted.
Week 2 (03/10)	Learning Objectives	Understanding of vector analysis
	Topics	Vector integral calculus
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 1 of the main text

	Assignments	To be posted.
Week 3 (03/17)	Learning Objectives	Understanding of vector analysis
	Topics	Curvilinear coordinates, Dirac delta function, Helmholtz theorem.
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 1 of the main text
	Assignments	To be posted.
Week 4 (03/m24)	Learning Objectives	Understanding of electrostatics
	Topics	Divergence and curl of electrostatic fields
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 2 of the main text
	Assignments	To be posted.
Week 5 (03/31)	Learning Objectives	Understanding of electrostatics
	Topics	Energetics of electrostatic fields
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 2 of the main text
	Assignments	To be posted.
Week 6 (04/07)	Learning Objectives	Understanding the boundary value problem of electric potentials
	Topics	Laplace equation and the method of images.
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 3 of the main text

	Assignments	To be posted.
Week 7 (04/14)	Learning Objectives	Understanding the boundary value problem of electric potentials
	Topics	Separation of variables and multipole expansions.
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 3 of the main text
	Assignments	To be posted.
Week 8 (04/21)	Learning Objectives	Midterm Examination (중간시험)
	Topics	
	Class Work (Methods)	Midterm Examination
	Materials (Required Readings)	
	Assignments	
Week 9 (04/28)	Learning Objectives	Understanding the electric fields in matter
	Topics	Mathematical formulation of the polarization field
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 4 of the main text
	Assignments	To be posted.
Week 10 (05/05)	Learning Objectives	Understanding the electric fields in matter
	Topics	Electric displacement and linear dielectrics
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 4 of the main text

	Assignments	To be posted.
Week 11 (05/12)	Learning Objectives	Understanding of magnetostatics
	Topics	Biot-Savart Law and Divergence/curl of magnetostatic field.
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 5 of the main text
	Assignments	To be posted.
Week 12 (05/19)	Learning Objectives	Understanding of magnetostatics
	Topics	The concept of the magnetic vector potential.
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 5 of the main text
	Assignments	To be posted.
Week 13 (05/26)	Learning Objectives	Understanding the magnetic fields in matter
	Topics	Magnetization
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 6 of the main text
	Assignments	To be posted.
Week 14 (06/02)	Learning Objectives	Understanding the magnetic fields in matter
	Topics	Auxiliary field H
	Class Work (Methods)	To be posted.
	Materials (Required Readings)	Chapter 6 of the main text

	Assignments	To be posted.
Week 15 (06/09)	Learning Objectives	Understanding the magnetic fields in matter
	Topics	Linear and Nonlinear media
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Chapter 6 of the main text
	Assignments	To be posted.
Week 16 (06/16)	Learning Objectives	Final Examination
	Topics	
	Class Work (Methods)	
	Materials (Required Readings)	
	Assignments	

VIII. Special Accommodations

Special students such as the challenged foreigners and North Korean defectors who need accommodations should contact the instructor or teaching assistant at the beginning of the semester.

IX. Aid for the Challenged Students

Lecture notes will be provided for the challenged and disabled students upon request. Also, examinations can be rescheduled for their convenience if necessary.