General Physics II: Administrative Information for 113–2

Course [PHY105E] General Physics II (Basic electromagnetism), Wednesday 9:10–12:00.

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Office hours ♠TODO:TBD♠

Webpage https://www2.nsysu.edu.tw/iwamoto/gp2.html

TA ♠TODO:TBA♠

Evaluation Midterm and term exams (mandatory) and performance (optional). With midterm- and term-exam scores A and B (out of 50 each) and performance score C (max 30), the grade is given by $\max[A+B, f(A+B+C)]$, where $f(x) = 0.62x + 20$ (half-up rounding). The performance is assessed by primer essays, mini tests, and classroom performance with criteria depending on student's grade level and department.

> *This course assumes students have taken my course of General Physics 1 (and passed the exams, preferably). If you are a student who wishes to enroll but has not taken my General Physics 1, please contact me before selecting the course. Otherwise it will be difficult to pass the exams.*

Themes and topics

An introductory course to electromagnetism. The goal is Maxwell's equations in vacuum (in integral form), which encapsulate the basic laws of electromagnetism.

You are required to have firm understanding on basic calculus and vector arithmetic as well as foundational understanding of mechanics, oscillatory motions, and waves. You first learn the concept of **fields**, which is the most crucial in electromagnetism (and even in modern physics). You then learn **various laws of electromagnetism** and reach **Maxwell's equations**, the monumental achievement in 19th-century physics. You notice that the equations contain not only the electromagnetic laws you have learned but also the electromagnetic waves, known as lights.

Several important topics are not covered in this lecture, which include electromagnetic fields in matter, vector calculus in cylindrical/spherical coordinates, and the differential formulation of Maxwell's equations.

Textbook

Serway & Jewett, *Physics for Scientists and Engineers with Modern Physics*, 10th ed. Cengage Learning.

- You are assumed to have learned Chapters 1–9 and 15–17. We discuss Chapters 22–33.
- Sho strongly recommends[*1] you to bring the book **(printed version)** to the lecture every week.

Other references[*2]

[Gr] Griffiths, *Introduction to Electrodynamics*, 4th ed. Cambridge U. Press.

[YF] Young & Freedman, *University Physics*, 15th ed. Pearson.

[Op] Ling et al., *University Physics*, Vol. 2 (Unit 2)[*3].

[*1] Sho treats you as an independent adult and avoids "forcing" you to do anything. When Sho "strongly recommends", Sho expects that you will likely learn with poor efficiency and get poorer exam results if you don't follow the suggestion.

[*2] This list is only for informational purposes. Stick to the textbook (Serway & Jewett) at this stage. Some of you will read [Gr] in your future lectures, so you may refer to it for advanced topics.

[*3] https://openstax.org/details/books/university-physics-volume-2

Student's goals

At the end of this course,

- I am familiar with line integrals and surface integrals of vectors.
- I can describe/calculate electromagnetic forces between charged objects or electric currents.
- I am used to dealing with fields (electric field $\vec{E}$ and magnetic flux density $\vec{B}$); I can use various laws of electromagnetism to calculate them in simple situations.
- I can analyze electric potential and relate it to work and potential energy.
- I can explain Maxwell's equations and their relations to electromagnetic laws.
- I can calculate currents or voltages in basic circuits.

Schedule

2.19	⟨1⟩ Coulomb's law. Electric field $\vec{E}$.	§22
2.26	⟨2⟩ Continuous charge distribution.	§22–23
3.05	⟨3⟩ Gauss's law. Electrostatic potential.	§23–24
3.12	NSYSU Sports Day	
3.19	⟨4⟩ Electrostatic potential.	§24
3.26	⟨5⟩ Capacitor.	§25
4.02	⟨6⟩ Electric current. Resistor.	§26
4.09	⟨7⟩ Direct-current circuits.	§27
4.16	**Midterm Exam**	
4.23	⟨8⟩ Magnetic field $\vec{B}$. Lorentz force.	§28
4.30	⟨9⟩ Biot-Savart law and Ampère's law. Magnetism.	§29
5.07	⟨10⟩ Faraday's law.	§30
5.14	⟨11⟩ Inductor.	§31
5.21	⟨12⟩ Alternating-current circuits.	§32
5.28	⟨13⟩ Lorentz equations. Electromagnetic waves.	§33
6.04	**Term Exam**	
6.11	⟨14⟩ More on Lorentz equations and vector calculus.	
6.18	No class (alternative learning period)	

(1) Introduction of Lecturer and TA

(2) Administrative Information on This Course

- We use Google Classroom for announcements and communication.
- Students with disabilities are encouraged to contact Sho immediately as well as *the student affairs office*[*4]. Special considerations are provided based on their advice.

2.1 Prerequisites and Goals

Prerequisites: The seven goals of Sho's General Physics 1.

- You can learn by yourselves.
- You have mastered differentials, integrals, and vector arithmetics.
- Units. Vector vs scalar. Significant figures.

Objective: Preparation for electromagnetism (DOP/MOES's most important course).

- Mathematics: Vector calculus, in particular, **line integrals** and **surface integrals**.
- Physics: Fields. Potential. Maxwell equations.

2.2 Evaluation and Make-up Principles

- Two exams: mandatory, 50 points each.
  - If you have reasons for absence, you must follow *Regulations for Leave Application*[*5]. Otherwise, your grade will be **X**.
- Performance score: Max 30 points. Not mandatory. (Some points may be given by Sho's discretion.)
  - Make-up will be provided for official leaves 公假 or COVID-19 if officially applied[*6].
  - No make-up for other health issues. Other reasons are assessed on a case-by-case basis.

Performance score is mainly determined by **mini tests** and **primer essay**.[*7]

- **Homework** is not included in the evaluation. Recommended to do it on Exercise Notebook.
- **Exercise Notebook** (paper only; e-notebook not accepted): If submitted at both midterm and term exams, you will be entitled for the final make-up (**D→C−**). No other effect on evaluation.
- **Tokens** are given for presentations etc. Important for very good grade.

2.3 Textbook + Notebook

Textbook **Required** (volume 2). You are *strongly recommended* to bring the textbook every week.

Three-notebook strategy (Sho's recommendation)

① Lecture Notebook: You summarize on this notebook what Sho says/writes on the blackboard.
② Exercise Notebook: Solve problems on this notebook. ③ Glossary and Formulae book.

[*4] 學務處諮商與健康促進組（特教生服務）https://ccd-osa.nsysu.edu.tw/p/412-1091-24059.php
[*5] 學生考試請假及補考辦法 https://oaa.nsysu.edu.tw/var/file/3/1003/img/1296/acade_rule_09.pdf
[*6] Apply on https://sis.nsysu.edu.tw/ . Indigenous peoples' festival holidays are respected.
[*7] Weight is not disclosed. Attendance contribution will be less than 2% of the total evaluation.

2.4 Lecture = (Mini test) + Lecture + Individual problem solving

Problem solving: Solve problems on your Exercise Notebook.

- You can discuss with others, ask for help, and use any tools.
- Sho may ask you to do a presentation on your answer. [Bonus for Performance Score]

Lecture rules
(1) We are colleagues, so we create lecture together.
(2) You are adult, so you can do anything except for disturbing me.
Conflicts between students are to be solved by students.

- **You must interrupt Sho** if you have questions/comments.[*8]
- You can drink water/non-alcoholic beverage (as long as room-regulation allows).
- **Do not eat anything in the lecture room**. Do not drink alcohol.
- Do not talk over phones. You can usually use computers, tablets, smartphones, etc.
  - It will disturb your concentration. It is your own risk.
- **[VOTE]** Should we kick-out students who are talking with others during lectures?

2.5 Other Remarks

Scientific remarks

- This course uses the SI unit system.
- The difference between Sho's and Textbook's notation: (You can use either.)
  - Cartesian unit vectors: $\vec{e}_x$, $\vec{e}_y$, $\vec{e}_z$ vs $\hat{\mathbf{i}}, \hat{\mathbf{j}}, \hat{\mathbf{k}}$
  - elementary charge: $|e|$ vs e $\quad (= 1.602\,176\,634 \times 10^{-19}\ \mathrm{C})$[*9]
- Sho always writes "$\log_{10}$" for base-10 logarithm and *tries to* use "ln" for natural logarithm. Please ask when ambiguous.

Administrative remarks

- If you want to use **ChatGPT** etc., read Sho's Guideline for Using Generative AI.
- You are very welcome to visit Sho during the **office hours**, but also in any other time.
- High-quality homework submissions from you might be shared with (but only with) people in this lecture, where your name will be hidden.
- Sho is extraordinarily strict against **plagiarism**.
  - Please read NSYSU's *Guidelines for Students' Academic Ethics and Handling of Cases in Violation of the Academic Ethics*. The guidelines, in particular Article II (3), (4), and (6), are taken into account when Sho evaluates students' reports or exam/quiz answers.[*10]

[*8] You should think this is **your duty** in all university lectures. Our job is not to finish the materials but to help you learn. Furthermore, you can help other students by asking questions! When you have questions, usually others have the same one (and it is Sho's fault). It also helps Sho, because Sho can improve the lecture.

[*9] The SI unit system was updated in 2019. Since then, this equation gives the definition of Coulomb "C" and thus this is an exact relation. Most of books, including the textbook (10th ed.), use old versions of the SI, in which the value of $|e|$ was determined by measurements.

[*10] An example: Imagine you are writing a report. If you "use" some books or others' reports, you must write so. If you had a discussion with others, you must write so.