General Physics II: Administrative Information for 114–2

Course [PHY105F] General Physics II (Basic electromagnetism), Friday 13:10–16:00.

Lecturer Sho Iwamoto [岩本 祥], Department of Physics. iwamoto@g-mail.nsysu.edu.tw

Office hours Tuesdays 14:00–16:00, Fridays 16:00–18:00. 理SC 2006–1.

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

TA Ms. Sumera Rani [蘇瑞妮], Dept. of Physics. sumairarani403@gmail.com
(Office hours: 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, 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 Prep Essays, Mini Tests, and classroom performance including attendance 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 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. Circuit analysis is not treated in detail, as it is addressed in a dedicated course[*1].

Textbook

Serway, Jewett, and Peroomian, *Physics for Scientists and Engineers with Modern Physics*, 11th ed. Cengage Learning. (Custom Version, ISBN 9786267533383)

- You are assumed to have learned Chapters 1–9 and 15–17. We discuss Chapters 22–33.
- You will use the book in the activities during lecture hours.
- Sho strongly recommends[*2] you to **bring the book** (printed version) to the lecture.

For advanced topicks, you may refer to:

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

[*1] Circuit Theory I, https://selcrs.nsysu.edu.tw/menu5/showoutline.asp?SYEAR=114&SEM=2&CrsDat=EE2400B

[*2] 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.

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 $\vec{B}$) and I can use basic laws of electromagnetism to calculate them in simple situations.
- I can analyze electric potential (voltage) in terms of electric fields and relate it to work and potential energy.
- I can explain Maxwell's equations and discuss light as an electromagnetic wave, including its basic physical properties.
- I can describe the microscopic and field-theoretic basis of electric circuits and circuit elements.

Schedule

2.27	National Holiday	
3.06	⟨1⟩ Coulomb's law. Electric field $\vec{E}$.	§22
3.13	⟨2⟩ Continuous charge distribution.	§22–23
3.20	⟨3⟩ Gauss's law. Electrostatic potential.	§23–24
3.27	⟨4⟩ Electrostatic potential.	§24
4.03	National Holiday	
4.10	⟨5⟩ Capacitor.	§25
4.17	⟨6⟩ Electric current. Resistor.	§26
4.24	**Midterm Exam**	
5.01	National Holiday	
5.08	⟨7⟩ Magnetic field $\vec{B}$. Lorentz force.	§28
5.15	⟨8⟩ Biot-Savart law and Ampère's law. Magnetism.	§29
5.22	⟨9⟩ Faraday's law.	§30
5.29	⟨10⟩ Inductor.	§31
6.05	⟨11⟩ Lorentz equations. Electromagnetic waves.	§33
6.12	**Term Exam**	

(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*[*3]. Special considerations are provided based on their advice.

2.1 Prerequisites = Goals of Sho's General Physics 1

- I know how to study at the university. I can learn by ourselves.
- I have mastered differentials, vector arithmetics, and how to handle quantities with units.
- I have understood the concepts of "energy" and "potential".

2.2 Objectives = One-year preparation for 電X學

GP1: Differentials, integrals, vectors. Force, energy, oscillation. *How to learn by yourselves.*

→ GP2: (math) Line integrals and surface integrals of vectors.
(phys) Fields. Voltage. Current. Circuit elements. Maxwell's equations. Light.

→ EE-Phys core lectures = Circuit theory + Electromagnetism + Electronics (電X學).

2.3 Evaluation and Make-up Principles

- Two exams: mandatory, 50 points each.
  - If you have reasons for absence, you must follow *Regulations for Leave Application*[*4]. Otherwise, your grade will be **X**.
- Performance score: not mandatory. (Some points may be given at Sho's discretion.)
  - Make-up will be provided for official leaves 公假 or COVID-19 if officially applied.[*5]
  - No make-ups for other health problems. Other reasons are on a case-by-case basis.
- The final make-up 補救 (only **D→C−**) may be granted if one submits Exercise Notebook at *both* exams (e-notebook not allowed) *and* shows regular effort (attendance, Prep Essay, etc.).

Performance score is mainly determined by **mini tests** and **primer essay**.[*6]

- **Homework** is not included in the evaluation. Recommended to do it on Exercise Notebook.
- You may submit **Exercise Notebook** at the exams, but it is effective only for the final make-up.
- **Tokens** are given for presentations etc. (Important to achieve very good grade.)

2.4 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 + ② Exercise Notebook + ③ Memory Notes

[*3] 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
[*4] 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
[*5] https://sis.nsysu.edu.tw/main.php Indigenous peoples' festival holidays are respected.
[*6] Weight is not disclosed. Attendance contribution will be less than 2% of the total evaluation.

2.5 Lecture = (Mini Test) + Lecture + Activity

Mini Test: 3–4 times in this semester. [Part of Performance Score]

- You cannot use mobiles/tablets/PCs/Internet. You cannot discuss with others.

Activity: Solve problems individually (on **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 score for Evaluation]

Lecture rules

Principles: (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.[*7]
- You can drink water/non-alcoholic beverage or eat small candies/gums/chocolates (as long as room-regulation allows).
- In principle, you can use computers, tablets, smartphones, etc. (but not during tests).
  - It will disturb your concentration. It is your own risk.
- Do not eat "foods." Do not drink alcohol. Do not talk over phones.
- **[VOTE]** Should we kick-out students who are talking with others during lectures?

2.6 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 $\quad (= 1.602\,176\,634 \times 10^{-19}\ \mathrm{C})$[*8]
- 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.[*9]

[*7] 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.

[*8] This equation is exact after 2019, when the SI unit system was updated. You may find obsolete explanation in old books, such as the 10th edition of the textbook.

[*9] 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.