

General Physics I: Administrative Information for 113-1

Course [PHY102E] General Physics I (Mechanics & Oscillatory Motion), Wednesday 9:10–12:00.

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Office hours Mondays and Tuesdays, 15:10–17:10. 理SC 2006-1.

Webpage <https://www2.nsysu.edu.tw/iwamoto/gp1.html>

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(Office hours: Tuesdays, 14:00–16:00, 物理館PH 4010)

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 $f(x) = 0.58x+25$ (half-up rounding). The performance is assessed by primer essays, mini tests, and classroom performance including attendance with criteria depending on student's grade level and department.

Themes and topics

An introductory course to University Physics, where students are expected to comprehend fundamental concepts in physics but also learn how to study physical science in university individually based on English textbooks.

You think about yourself and **how you can learn physics efficiently** so that you make your NSYSU life more enjoyable and satisfactory. Throughout this semester, you try to build your way of learning, where you need to **learn proactively** by utilizing lectures and books given in English.

This lecture's second goal is to learn **fundamental concepts** in physics, such as energy and force. Toward the goal, you begin with **basic calculus and vector arithmetic**: you learn differentials, essential integrals, and calculations with vectors. Using those tools, you analyze **three-dimensional motions of particles** and **oscillatory motions and waves**.

The tools and concepts you learn are further utilized in future lectures, such as General Physics 2, electromagnetism, and electronics.

This course is planned as a one-year course. Students who want to take General Physics 2 by Sho Iwamoto should take this course.

Textbook

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

- Chapters 1–17 (Volume 1) in this semester. Next semester will cover Chap. 22–33 (Volume 2).
- You will use the book in the activities during lecture hours.
- Sho strongly recommends^{*1} you to bring the **physical book** (printed version) to the lecture.

^{*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.

Student's goals

At the end of this course,

- I know how to study at the university. I have “my way of learning” customized for my personality and cognitive characteristics.
- I know how to study efficiently, proactively, and individually based on English textbooks.
- I can perfectly handle quantities with physical units without confusing vectors and scalars.
- I am familiar with differentials, integrals, and vector arithmetic, and can use them to analyze three-dimensional motions.
- I can explain “energy”, “work”, “potential”, “momentum”, and relations among them.
- I can express waves by trigonometric functions and analyze them using calculus techniques.

Schedule

9.11	$\langle 1 \rangle$ Units. Significant figures. (+ How to Learn)	§1.1, 1.3–6
9.18	$\langle 2 \rangle$ Basic Math. Derivatives. 1D-Motion. (+ How to Read a Textbook)	§2, B.1–4, B.6
9.25	$\langle 3 \rangle$ Integrals. Vectors. (+ How to Attend Lectures)	§3, B.7
10.02	$\langle 4 \rangle$ 2D-Motion.	§4
10.09	$\langle 5 \rangle$ Force. Newton’s Laws. Frictions.	§5
10.16	$\langle 6 \rangle$ Circular Motion. Frame. Fictitious Force.	§6
10.23	$\langle 7 \rangle$ Series Expansion. Differential Equations. Uncertainty.	§B.5, B.8

10.30 Midterm Exam

11.06	$\langle 8 \rangle$ Work and Energy. Conservative Force. (+ Exam Review)	§7
11.13	$\langle 9 \rangle$ Energy Conservation. Power.	§8
11.20	$\langle 10 \rangle$ Momentum. Impulse. Elastic Collision. Center of Mass.	§9
11.27	$\langle 11 \rangle$ Oscillatory Motion. Waves.	§15–16
12.04	$\langle 12 \rangle$ Waves and their Superpositions.	§16–17
12.11	$\langle 13 \rangle$ Angular Velocity and Angular Acceleration. Torque.	§10–11
12.18	$\langle 14 \rangle$ Angular Momentum. Rigid Objects.	§11–12

12.25 Term Exam

1.01 National Holiday

1.08	$\langle 15 \rangle$ Gravity. (+ Exam Review)	§13
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next semester:	2.19–3.05 $\langle 1 \rangle$ – $\langle 3 \rangle$	Electrostatics.	§22–24
	3.19–4.02 $\langle 4 \rangle$ – $\langle 6 \rangle$	Capacitor and Resistor. Current.	§25–26
	4.09	Midterm Exam	
	4.16–5.07 $\langle 7 \rangle$ – $\langle 11 \rangle$	Magnetostatics.	§28–29
	5.14–6.04 $\langle 11 \rangle$ – $\langle 14 \rangle$	Electromagnetism. Light.	§30–31, §33
	6.11	Term Exam	
	6.18	$\langle 15 \rangle$ Light.	§33

(1) Introduction of Lecturer and TA

(2) University Principles

1. **No longer kids.** We are colleagues.
2. Learn by yourself. **You'll never be taught.**
 - I don't teach. I'm not your teacher 老師 but lecturer 講師.
3. Do own duty.
 - I want money, so do researches+lectures. If you want academic credits, get ≥ 60 points.
 - "Teach you physics" is not my duty. "Attend lectures" is not your duty.
 - 1 academic credit (學分) = (50 minute lecture + 100 minute self-study) $\times 18$ weeks.
4. Ask for help. Friends, colleagues, professors, secretaries, TA, ...
 - **Nobody helps you** if you don't ask for help. Everyone will help you if you ask.
(In particular, the TA will do nothing for you if you do not ask.)
 - Take care of mental health, money, academic honesty, credit, and colleagues/family.
 - Visit professors anytime. We will **welcome** you, especially during office hours.

(3) Administrative Information on This Course

3.1 Objectives

- DOP/MOES's most important course: Electromagnetism (2nd-year, two semesters).
 - Mathematics: Vector calculus = **differentials** and **integrals of vectors**.
 - Physics: Quantities with **units**. Concepts such as **force**, **energy**, **work**.
- Preparation for "*Preparation for Electromagnetism (= General Physics 2)*"
 - Mathematics, physics, and **how to learn by yourselves**.

3.2 Evaluation and Make-up Principles

- Two exams: mandatory, 50 points each.
 - If you have reasons for absence, you must follow *Regulations for Leave Application*^{*2}. Otherwise, your grade will be X.
- Performance score: Max 30 points. 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.^{*3}
 - No make-ups for other health problems. Other reasons are on a case-by-case basis.
- See *NSYSU Guidelines for Evaluation*^{*4} for grading system.
- Make-up 補救 may be provided if their score is *slightly* less than 59.5 **and** they have shown continuous effort through their regular attendance and engagement with problem exercises.

Hint: For Grade C-, get ≥ 59.5 points out of 130 [= 50 (midterm) + 50 (term) + 30 (activity)].
If you want A-, get ≥ 94.0 points out of 130, or get ≥ 79.5 out of 100 (two exams).

^{*2}學生考試請假及補考辦法 https://oaa.nsyst.edu.tw/var/file/3/1003/img/1296/acad_rule_09.pdf

^{*3}<https://sis.nsyst.edu.tw/main.php> Indigenous peoples' festival holidays are respected.

^{*4}學生成績作業要點 https://oaa.nsyst.edu.tw/var/file/3/1003/img/1296/acad_rule_32.pdf

3.3 Textbook + Notebook

Textbook Required. You are *strongly recommended* to bring the textbook every week.

- Volume 1 for this semester, volume 2 for the next semester.
- Around NT\$1300 for Vol. 1+2. Contact Mr. Yi Ling Hsu [許益凌] TEL:0919-121727.
https://tsanghai.com.tw/book_detail.php?c=264&no=3826

Three notebooks ① Lecture Notebook ② Exercise Notebook ③ Glossary + Formulae Book.

- ① Paper (*recommended*) or e-notebook.

During lectures, you need to summarize what Sho says/writes on your notebook.

- ② **Paper notebook, required** and used in “Activity”. Solve problems on this notebook.
You may submit it at the exam to show your regular effort. [E-notebooks are not accepted.]
- ③ Either paper or e-notebook. Introduced in the next lecture.

Hints • Sho will not provide lecture notes. Take notes by yourself. Improve note-taking skill.
• Open both textbook and notebook together in lectures. (→Either of them must be paper.)

3.4 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 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.*⁵
- 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?

Communication

- We use Google Classroom for announcements and communication.

*⁵You 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.

3.5 Home Study = Homework + Review + Preview

Homework: ① Minimal homework (+ Primer Essay) ② Standard tasks ③ Extra tasks.

- Without doing minimal homework, you **will not understand** the lectures.
- Primer essay is included from Homework 03. (online; Google Classroom)
 - Submit your answer by **1:00am** of the lecture day. [Part of Performance Score]
 - Your score may get higher if you attend the (previous) lecture.

Preview: **Making Glossary** is critically important in EMI lectures. → next week.

3.6 Your goals

- Get used to university = Learn *how to learn*.
 - Lectures: Preview + Attendance + Review.
 - Self-study: Scheduling. Read the textbook.
 - Help each other: Office hours. Share your note. Share your solution.
- Essential math: differentials, integrals, vectors.
 - Global standard of engineering students: can calculate derivatives of “simple” functions.
- Essential phys:
 - Quantity with unit.
 - Fundamental concepts: force, energy, momentum, angular momentum, ...

3.7 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 $\hat{i}, \hat{j}, \hat{k}$
 - elementary charge: $|e|$ vs e ($= 1.602\,176\,634 \times 10^{-19} \text{ C}$)^{*6}
- Sho always writes “ \log_{10} ” for base-10 logarithm and *tries to* use “ln” for natural logarithm. Please ask when ambiguous.

Administrative remarks

- Students with disabilities are encouraged to contact Sho immediately as well as *the student affairs office*^{*7}. Special considerations are provided based on their advice.
- 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.^{*8}

^{*6}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.

^{*7}學務處諮詢與健康促進組（特教生服務） <https://ccd-osa.nsysu.edu.tw/p/412-1091-24059.php>

^{*8}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.

(4) Suggestions from Your Seniors

(5) Suggestions from Sho

Hint: These are very subjective. No need to follow. Decide by yourself.

General Learning method

- Buy a physical textbook. Prepare a physical notebook.
 - New life! No time to adopt to new tech!! Stick to the old style; use e-book from 大三.
 - Quickly jump across an e-book? Impossible. E-book users cannot catch up with lectures.
 - E-note users may spend too much for “beautiful note”. Waste of time.
- Always try to improve your learning method. You are going to learn for more than 50 years.
- Look for “learning tips” on the internet. For example,
 - <https://www.cmu.edu/student-success/other-resources/fast-facts/succeed-in-physics.pdf>
 - <https://www.wikihow.com/Learn-Physics>
 - <https://www2.oberlin.edu/physics/dstyer/StudyTips.html>
- Make a week timetable 課表 including home-study.
- Can't focus at home? Yeah, I cannot!! Go to a library or a study room to focus!

Learning Physics

- **Distinguish vectors from scalars. Never forget units.**
- Don't try hard: study efficiently and cleverly. Don't give up: study steadily.
 - Physics is 頓悟, therefore difficult. I needed a few years to understand some concepts.
 - **Discuss with friends**, which will help *your* understanding.
- Don't try to calculate quickly. Mistake-in-calculation is the worst mistake.
- [advanced note] Don't solve problems first. Do it after you understand related concepts.
 - In high school, you could develop your understanding by solving problems. In university, it does not happen because each concept is more abstract and more complicated.

During Lectures

- Bring your paper textbook.
- **Never hesitate to ask questions. Ask it immediately when you have a question.**
- Come before 9:05am.
 - Sho could *never* attend the lecture starting at 9am when he was undergrad. Therefore, Sho has a huge respect to students coming at that early morning.
- Take note. Develop your note-taking skill, which you will employ for more than 30 years.
- **Never hesitate to ask questions. Ask it immediately when you have a question.**

Work Together

- Share your solutions with others. *Sho will never provide solutions of homework/exam.*
- Visit Sho during office hours. Usually he is bored 無聊/寂寞 during office hours.
- **Never hesitate to ask questions. Ask it immediately when you have a question.**