112 學年度第二學期普通物理一(物理系)課程大綱

Syllabus of General Physics (II) (for Physics Major), Spring 2024
11220PHYS114000

一、基本資訊 (Basic Information)

Course Hour: T3T4R3R4 for 16 weeks (2/19/2024-6/7/2024)

Instructor: Daw-Wei Wang 王道維 (Physics Department, NTHU)

Research Area:
Condensed Matter Theory and Interdisciplinary Application of AI

Current Position:
2021-, Vice-Director, Center for the Application and Development of AI Humanity and Social Science, NTHU
2016-, Director, Counseling Center, NTHU
2015-, Joint Professor, Center for General Education, NTHU
2010-, Professor, Department of Physics, National Tsing Hua University, Hsinchu, Taiwan

Office Hour:
Friday 3:00-5:00 pm in Rm P507 of General Building III (by reservation)

Further Information:
School Website: https://phys.site.nthu.edu.tw/p/406-1335-58679,r3581.php?Lang=zh-tw
Research Group: http://www.phys.nthu.edu.tw/~aicmt/
Personal Blog: https://blog.udn.com/dawweiwang/

二、課程說明(Course Description)：

This class is designed for first-year physics major students and students in related majors. Our primary focus is to provide a solid foundation of basic knowledge through various approaches, including in-class lectures, office hours, TA sessions, homework, and exams. If needed, we will incorporate numerical simulations, visualized presentations, and in-class demonstrations of experiments. To personalize and uptimize the learning results, we will introduce the application of ChatGPT as a personal TA for self-study, homework, and mini-project preparation. This will allow students to receive tailored assistance and guidance. We believe that highly motivated and self-disciplined students will excel in this class. However,

we hope even students with less motivation will still have the opportunity to learn important methods and basic knowledge, which could prepare them better for their future studies and careers.

三、指定用書與參考書(Textbook and References)

R.A. Serway, Physics for Scientists and Engineers & with Modern Physics

(2018, 10th ed. ISBN：9789579282147)

https://www.tsanghai.com.tw/book_detail.php?c=264&no=3826#p=1

I will prepare my own lecture notes for this course. Most of the content and homework will follow this textbook, but it is still not required for this course. Students could share the textbook with each other or if needed.

Further references students may consider is following:

1. R. Feynman, The Feynman's Lecture on Physics
2. Halliday & Resnick, Principles of Physics

四、成績考核(Evaluation)

Homework (20%) , Midterm Exam I (25%), Midterm Exam II (25%), Final Exam (30%)
There are two remedial methods: (1) prepare a mini-project by ChatGPT (or other AI assistants) as a remedial homework after the 16th week. (Some oral presentation may be needed.) (2) participate TA office hour actively and asked questions with records. Note that these two remedial methods are only for students with original final score between 45 and 65, and the highest final score after modification will not be more than 65. The purpose is to encourage students to use AI for their personal coach for the future. More details will be announced after the 2nd midterm.

五、助教與時間 (Teaching Assistant and their office hours)

歐予恩(oun1221@gmail.com)

李謙睿(ray100182181235@gmail.com)

何基廷(aeio6646@yahoo.com.tw)

TA time: Tuesday 7-9pm in Rm 124 of Physics Building.
Note that the TA time will start from the third week (3/5). Further adjustment will be announced in the class and on the E-Learning.

六、教學進度(Tentative Schedule and will be updated in the first week)

wk	M/D	Subject
1	02/20	Introduction to this Class
	02/22	General Introduction to Electromagnetism
2	02/27 (HW1 out)	Static Electric Field and its Application in Daily Life
	02/29	Electric Field and Potential by Continuous Charge Distribution
3	03/05	Gauss' Law
	03/07 (HW2 due)	Application of AI Virtual Assistant (I)
4	03/12	Capacitance and Dielectrics
	03/14 (HW2 out)	Current and Resistance
5	03/19	Static Magnetic Field and its Application in Daily Life
	03/21	Faraday's Law
6	03/26 (HW2 due)	Inductance and AC Circuits
	03/28	Buffer and Review
7	04/02	Midterm Exam (I)
	04/04	National Holiday
8	04/09	Electromagnetic Waves
	04/11 (HW3 out)	Application of AI Virtual Assistant (II)
9	04/16	Maxwell's Equation (I)
	04/18	Maxwell's Equation (II)
10	04/23 (HW3 due)	Introduction to Light
	04/25 (HW4 out)	Wave Optics

11	04/30	Interference and Diffraction
	05/02	Polarization and Energy Propagation
12	05/07 (HW4 due)	Buffer and Review
	05/09	Midterm Exam (II)
13	05/14	Brief History of Modern Physics
	05/16 (HW5 out)	Introduction to Special Relativity
14	05/21	Application of AI Virtual Assistant (III)
	05/23 (HW5 due)	Introduction to Quantum Mechanics
15	05/28	Introduction to Atomic and Molecular Physics
	05/30	Introduction to Solid State and Condensed Matter Physics
16	06/04	Introduction to Particle Physics and Cosmology
	06/06	Final Exam

七、我們為何與如何導入 AI (Why and How we introduce AI)

本課程導入 AI 的目的是因為知道這是無法避免的趨勢，反而應該使用 AI 來輔助自我學習，即使有些同學考試不理想，只要可以善用 AI 來協助學習，還是可以有機會(做補救教學的概念)。但是這並非放水，因為若考試考不好也不會善用 AI，一樣會被當掉。我相信對於大部分的同學，即使成績及格，也會學到如何善用 AI 來協助自己，讓這工具未來還可以用在其他課程，繼續幫助自己成長。

我們會以 ChatGPT 的 API(應用程式介面)為基礎，自行開發針對本課程而設計的對話機器人，讓所有學生都可以使用(免費免註冊)，並且教學生如何使用並作為自學與補強的參考依據。目前頁面截圖如下，其他的會在課堂或助教演習課中多些說明。

使用的方式 主要透過以下幾個方式：

1. 課堂上先介紹 ChatGPT 的原理
2. 課堂上示範如何使用我們開發的應用程式
3. 作業中安置一些需要用 ChatGPT 回答的問題(但不超過 15%)
4. 演習課助教會繼續教同學如何使用
5. 考試禁止使用 ChatGPT，仍是傳統的筆試
6. 對於前兩次期中考成績不理想的同學(標準後來公布)，可以考慮期末考以後使用 ChatGPT 做報告(需要能演示複雜的公式推導、寫 Python 程式、數值計算、畫圖表呈現等等，皆非一般大一程度可以做到的內容)，並且必要時以口試確認。若最終成績在 45-65 之間者，期末成績最高可調整到 65 分，不會影響其他不用補考者的成績或排序。