

清華大學物理系 實驗物理 Spring 2023 (tentative 暫定)

課程概述與目標：

本課程分兩部分，一部分以進階力學、基礎電磁學、實驗方法為主，每週實驗四小時以上，含各實驗單元的原理介紹與操作，及實驗預習及結果報告繳交。另一部分以MATLAB為基礎，學習實驗的模擬、數據分析與擬合等，以實際作出一個小專題計畫為目標。

本教學目標主要如下：

1. 利用簡單的實驗儀器、與實驗模擬，分析軟體，驗證物理定律。
2. 熟悉基本儀器之特性與使用方法與數據的分析，以利將來從事更精密物理實驗與研究。
3. 培養獨立自主的研究精神，對於實驗種種因素所產生的實驗誤差及提升問題解決能力。
4. 學習使用電腦程式設計，模擬物理實驗及分析數據。

This is a one semester course intended to give students an introduction to basic laboratory and laboratory soft-ware techniques and software based physics simulation and theoretical analysis in the context of classical mechanics and electromagnetism. The course consists of a 4-hour lecture/lab-period per week. This is a hands-on class. You will have one lab partner for each experiment.

The primary goal of the course is to introduce students to basic concepts in experimental physics including:

- Acquire basic concepts related to the experiments
- Learn how to make reliable measurements
- Understand standard measurement techniques for several physical properties.
- Choose the appropriate instruments and measurement techniques for a given measurement task.
- Using computer programming to simulate experiment and perform analysis of data
- Practice writing laboratory reports
- Learn how to approach an experiment systematically.

成績計算方式為預報，結報，實驗工作簿 50%，上課，做實驗情況、MATLAB homework 15%，期末小專題成果與報告 35%。

實驗物理 實驗課程表 2023.2-2023.6 紅色字表示當日不上課

週次	日期	組別/實驗名稱			
		1-4 組	5-8 組	9-12 組	13-16 組
1	2/13[一] 2/14[二] 2/17[五]	課程說明與分組，MATLAB 程式安裝。 MATLAB programming I. Chaps. 1, 2.1-5,			
2	2/20[一] 2/21[二] 2/24[五] 梅竹賽	Exp. A1	Exp. A2	Exp. A3	Exp. A4
3	2/27[一] 彈休 2/28[二] 和平紀念日 3/3[五]	Exp. A1	Exp. A2	Exp. A3	Exp. A4

4	3/6[一] 3/7[二] 3/10[五]	Exp. A2	Exp. A3	Exp. A4	Exp. A1
5	3/13[一] 3/14[二] 3/17[五]	Exp. A3	Exp. A4	Exp. A1	Exp. A2
6	3/20[一] 3/21[二] 3/24[五]	Exp. A4	Exp. A1	Exp. A2	Exp. A3
7	3/27[一] 3/28[二] 3/31[五]	MATLAB programming II, Chaps. 9, 14.1-4, 15.1-4			
8	4/3[一] 清明連假 4/4[二] 清明連假 4/7[五] 自行練習 MATLAB	由於本週放假日太多，週五班課程調整為 MATLAB 自習課。			
9	4/10[一] 4/11[二] 4/14[五]	Exp. B1	Exp. B2	Exp. B3	Exp. B4
10	4/17[一] 4/18[二] 4/21[五]	Exp. B2	Exp. B3	Exp. B4	Exp. B1
11	4/24[一] 4/25[二] 4/28[五]	MATLAB programming III, Chaps. 16, 19			
12	5/1[一] 5/2[二] 5/5[五]	Exp. B3	Exp. B4	Exp. B1	Exp. B2
13	5/8[一] 5/9[二] 5/12[五]	Exp. B4	Exp. B1	Exp. B2	Exp. B3
14	5/15[一] 5/16[二] 5/19[五]	MATLAB programming IV, Project in Physics experiment simulation with MATLAB I			
15	5/22[一] 5/23[二] 5/26[五]	Project in Physics experiment simulation with MATLAB II			
16	5/29[一] 5/30[二] 6/2[五]	Project in Physics experiment simulation with MATLAB III			
17	6/5[一] 6/6[二] 6/9[五]	MATLAB project poster presentations			

A1 如何寫報告，各實驗重點講解 A2 重力常數測定 A3 力學耦合振盪 A4 鎖相放大器基本原理
B1 非線性振盪 B2 法拉第定律與地磁測量 B3 磁力、磁矩測量磁滯現象、光速測量 B4 鎖相放大器應用測量