

清華大學物理系 實驗物理 Spring 2024

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 2024.2-2024.6 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	2/19[一] 2/20[二] 2/23[五]	課程說明與分組，MATLAB 程式安裝。 MATLAB programming I, Chaps. 1, 2.1-5,			
2	2/26[一] 2/27[二] 3/1[五] 梅竹賽	MATLAB programming II, Chaps. 9, 14.1-4, 15.1-4			
3	3/4[一] 3/5[二] 3/8[五]	MATLAB programming III, Chaps. 16, 19			

4	3/11[一] 3/12[二] 3/15[五]	MATLAB programming IV, Chaps. 10, 11			
5	3/18[一] 3/19[二] 3/22[五]	Exp. A1	Exp. A2	Exp. A3	Exp. A4
6	3/25[一] 3/26[二] 3/29[五]	Exp. A2	Exp. A3	Exp. A4	Exp. A1
7	4/1[一] 4/2[二] 4/5[五] 清明連假	由於清明連假，週一週二班課程調整為 MATLAB 自習課。			
8	4/8[一] 4/9[二] 4/12[五]	Exp. A3	Exp. A4	Exp. A1	Exp. A2
9	4/15[一] 4/16[二] 4/19[五]	Exp. A4	Exp. A1	Exp. A2	Exp. A3
10	4/22[一] 4/23[二] 4/26[五]	Exp. B1	Exp. B2	Exp. B3	Exp. B4
11	4/29[一] 4/30[二] 5/3[五]	Exp. B2	Exp. B3	Exp. B4	Exp. B1
12	5/6[一] 5/7[二] 5/10[五]	Exp. B3	Exp. B4	Exp. B1	Exp. B2
13	5/13[一] 5/14[二] 5/17[五]	Exp. B4	Exp. B1	Exp. B2	Exp. B3
14	5/20[一] 5/21[二] 5/24[五]	Project in Physics experiment simulation with MATLAB I			
15	5/27[一] 5/28[二] 5/31[五]	Project in Physics experiment simulation with MATLAB II			
16	6/3[一] 6/4[二] 6/7[五]	Project in Physics experiment simulation with MATLAB III			
17	6/10[一] 端午節 6/11[二] 6/14[五] 6/17[一]	MATLAB project poster presentations			

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